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Chassiotis (S.). **La Viticulture en Grèce.** [Vine cultivation in Greece.]—*La Vie Agricole et Rurale*, ii, no. 41, Paris, 13th Sept. 1913, pp. 378-380.

The author states that *Phylloxera* does not attack the Greek vineyards, but is met with in the recently conquered provinces. *Polychrosis*, *Clysia*, and occasionally *Pyralis*, do great damage, especially to currants, the caterpillars being protected by the thickness of the clusters. *Otiorrhynchus* is often very abundant in light soils, and locusts sometimes devastate certain districts.

Vuillet (A.). **La Pyrale du Mais (*Pyrausta nubilalis*, Hb.).** [The Maize Pyralis, *P. nubilalis*, Hb.]—*La Revue de Phytopathologie Appliquée, Paris*, i, no. 8, 20th Sept. 1913, pp. 105-107, 1 fig.

The author says that in the south-west of France the cultivation of maize is of considerable economic importance, and the crop is unfortunately attacked by a number of pests, both fungi and insects, which occasionally reduce the harvest materially. The caterpillars of *Chloridea obsoleta* and *Laphygma exigua* and others and especially those of *Pyrausta* (*Botys*) *nubilalis* are said to be its chief enemies. The injury done by *P. nubilalis* is frequently small and passes unnoticed, but at times is serious, though the growers generally attribute the damage to some entirely different cause, and the author thinks that it is important to draw attention to the existence of this pest and the possible damage which it may cause for this reason.

The insect is known in France as the "pyrale du mais" and in Germany as "Hirsezünsler" or "Gliedwurm." The author describes the larva, chrysalis and perfect insect, and goes on to say that the caterpillar is a more or less omnivorous feeder and frequently damages hops, hemp and millet. The reed of Provence (*Arundo donax*), *Setaria viridis* and other graminaceous plants, *Artemisia vulgaris* (mugwort) and *Inula squarrisa* are also attacked, and Dr. Lafaury reports having found the larvae in the pods of haricot beans and in large oak galls.

The moths fly by night during the month of June. The female lays her eggs singly on the twigs or branches of the food-plants and in the Graminaceae generally on a leaf-sheath near to a knot. The eggs hatch about 14 days after laying and the young larva immediately penetrates into the interior of the stalk and commences boring a gallery in the medullary tissue, sometimes downwards, but more generally upwards, with the result that those parts of the plant above the point of attack begin to turn yellow and finally dry up prematurely, if not previously broken by the wind. In the case of maize, the caterpillars penetrate into the cob and may even gnaw the grains from within outwards, thus destroying the crop directly. The point of attack is generally in the upper internodes immediately below the spike. The presence of the larva can be detected by the excrement which is

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pushed out from the point of entry. When the larva is full-grown it descends towards the lower part of the plant near to its point of emergence from the soil or above, and, in the case of maize, as far as the roots, and there it winters. In the May following it weaves a cocoon and pupates.

It would appear that *P. nubilalis* has few or no parasites. J. Fallou in 1880 raised a large number of the species without being able to obtain either a Dipteron or a Hymenopteron. Jablonowski has however noted in Hungary a Tachinid (*Ceromasia interrupta*, Rond.) which attacks it. The author recommends against this pest the use of lamp traps in the month of June and says that these lamps should be placed at a considerable distance from the fields which it is sought to protect. After the end of July he advises that the fields should be carefully examined and all plants which present any signs of attack should be cut at the next knot below the point of entry, as in this way the attack can be at least minimised. The author experimented on a number of plants by blocking the entrance of the gallery with tar applied by means of a brush, but found it useless. He says it is very necessary to pull up and destroy before spring all stems remaining on the field after harvest, as it is practically certain that most of these will contain a hibernating caterpillar. The food-plants named should also be sought for in waste land around the maize fields and carefully destroyed.

Tschaen (E.). **La Noctuelle de l'Artichaut** (*Gortyna ochracea*, **Hübner**). [The Artichoke Noctuid.]—*La Revue de Phytopathologie Appliquée, Paris*, i, no. 8, 20th Sept. 1913, pp. 107-108, 2 figs.

The artichoke in the neighbourhood of Hyères are said to have been seriously attacked this year by the larvae of *Pyrameis cardui*, L., and *Gortyna ochracea*, Hb., both insects being frequently found upon the same plant. In some seasons the damage is small and exceedingly local, but in the present year the invasion has been serious, and the two species appear to have done about equal damage. The author describes the perfect insect, caterpillar and chrysalis of *G. ochracea*, which is well known as a pest of the artichoke in Algeria and the South of France.

Amongst the host plants of the caterpillar the author mentions *Sambucus ebulus* (ground elder), *Lappa communis* (burdock), *Valerina officinalis* (valerian), cardoons, *Verbascum thapsus* (Aaron's Rod), *Digitalis purpurea* (foxglove) and others sufficient to show that the larva is more or less omnivorous. It has also been damaging potatoes in Germany and in England, and hops in Bohemia. On the artichoke, the larva of this Noctuid lives in the floral branches, and a minute opening blocked by a small lump of excrement in the axil of each leaf or of each branch marks its presence. These branches present galleries 7-8 mm. in diameter which extend from the neck to the capitulum. One or two, but rarely more, larvae are found in

each gallery. Frequently the gallery is bored throughout the whole length of the floral stem before the capitulum is attacked; in this case all the other heads on this stem fail to develop and in this way it is possible for a single larva to destroy the fruit of a whole plant. About the middle of May the larva passes downwards to the roots and pupates at the end of August or in the early days of September.

According to the reports received from different districts the adults of the second brood generally appear during the summer from the end of July and even into October, and the eggs are laid at the base of the food-plants. A certain number of caterpillars and pupae hibernate and emerge in the following spring.

According to Gilmer, earwigs frequently pentrate into the galleries and destroy a considerable number of pupae. The larva is also parasitised by *Ichneumon sanguinatorius*, Grav. The author says that it is obvious from the mode of attack that insecticides are of little value against this pest, though possibly if used just before the hatching of the eggs they might be of some service, but he considers that it is more important to determine with care the date of the various flights of the perfect insect (he is at present engaged on observations to determine this) and to take measures accordingly. He suggests that trap lamps might be of some use in destroying a certain number of the moths, but that unless carried out on a considerable scale and embracing an area considerably beyond that of the crops sought to be protected, it would not be of any very real value. He suggests that care should be taken to destroy all plants which may contain larvae or pupae and in doing this to bear in mind the omnivorous character of the larvae.

Vuillet (A.). **Un Lépidoptère nuisible aux Pois.** [A lepidopterous pest of peas.]—*La Revue de Phytopathologie Appliquée, Paris*, i, no. 8, 20th Sept. 1913, pp. 110.

The author says that peas are frequently attacked by the caterpillars of Microlepidoptera and most frequently perhaps by those of *Grapholitha nigricana*, Steph. He has now observed in the department of Gers, at Ornezan, a field of peas seriously attacked by the larvae of a butterfly, *Lampides baetica*, L. This insect is widely distributed over the whole of southern and central Europe, the Canary Islands, Africa, Madagascar, Western and Central Asia and Australia. In France it is chiefly found in the centre and south-west, but it has also been met with in Brittany. The caterpillar will apparently feed upon the pods of most leguminous plants and especially upon *Colutea arborescens* (bladder-senna), *Medicago sativa* (lucerne), *Ulex europaeus* (furze), *Genista, Sarothamnus scoparius* (broom), and Green places it amongst the pests of *Crotalaria* in Ceylon. According to some authors pupation also takes place within the fruit, but the author after an examination of a large number of infested pods found no pupae, and in the insectary pupation took place upon the earth. Nothing of the nature of symbiosis with ants was observed.

In Europe there are two broods of this species, which fly between June and October, and the author is of opinion that on 8th August, when he commenced his observations, the majority of the larvae had already quitted the pods to pupate. Of the caterpillars collected on that date two began to pupate on the 14th and 15th and the insects emerged on the 26th and 27th August. He says that until further knowledge of the life-history of the insect has been obtained it is impossible to suggest any rational method of meeting its attack.

CRIDDLE (M.). **Insect Pests of Southern Manitoba during 1912.**—*Ann. Report Entom Soc. of Ontario, Toronto,* 1913, pp. 97-100.

The author introduces his list by the remark that in Saskatchewan and Alberta, as well as in Manitoba, the planting of cereals has enormously increased the food of insects which formerly had only a few grasses to live on, and that their consequent multiplication demands great vigilance. A few Hessian Fly larvae were discovered late in June, pupae on 13th July and the imago on 6th September; adults of the Greater Wheat-stem Maggot, more frequent on grasses than grain, were met with from May to mid-September. *Oscinis carbonaria* killed numbers of spring wheat plants, the larvae being plentiful in June and July, and adults emerged on 19th to 27th July from pupae collected on the 13th, promising a third brood before winter. *Sephus occidentalis*, which attacked wheat and rye throughout the Province, the damage diminishing towards the centre of fields, should be met by ploughing at least six inches deep in autumn or in spring, with subsequent packing. An outbreak of *Melanoplus atlantis, packardi, angustipennis, bivittatus, femur-rubrum, dawsonii* and other grasshoppers took place in June and early July, when they attacked the heads of all kinds of grain, but they were kept down by horse-droppings, salt and Paris green. Wet weather impeded their distribution before breeding, killed and weakened many, and assisted the assaults of *Empusa grylli* upon them; but in spite of all this they deposited large quantities of egg-masses, which threatened an outbreak, though less severe, in the following May. Colorado beetles were increasing, and attacked flowering species of *Nicotiana* as well as potatoes. The latter also suffered from *Macrobasis unicolor* var. *murina*, which normally lives on wild peas, vetch and loco weed. *Entomoscelis adonidis*, which had increased, attacked Virginian stock and turnips; root-maggots, cutworms, and the cabbage-fly had become rare, but *Pieris protodice* was common. The Larch Saw-fly disappeared earlier than usual, possibly being attacked by fungus, but *Lophyrus abietis* defoliated many spruces. These flies emerge in August, lay, and die before winter. The larvae hatch in June, and by the middle of July they are all fully developed and spin cocoons on the leaves or under the branches, not under dead leaves or moss on the ground. *Saperda calcarata*, which destroys the poplar groves, should be dealt with by burning the attacked trees.

Treherne (R. C.). **Notes on Injurious Insects in British Columbia in 1912.**—*Ann. Report Entom. Soc. of Ontario, Toronto,* 1913, pp. 106-111, 1 fig.

The author chronicles the abundance of *Tmetocera ocellana* in the Lower Fraser Valley; where *Ludius suckleyi*, and another Elaterid beetle, which seemed to be *Limonius discoideus*, devoured apple buds and blossoms; *Magdalis aenescens* attacked dead bark tissues; *Aphis sorbi*, which spends the autumn, winter and spring on the apple trees and migrates to an unknown host in summer, deformed the fruit and hindered its development; *Aegeria tipuliformis* was commonly found; *Bryobia* and *Tetranychus* are present; and *Otiorrhynchus ovatus* was the most serious pest in the district [see this Review, Ser. A, i, pp. 92-94]. In the Fraser Valley *Malacosoma erosa*, west of the Cascade Range, did much damage to all but pear trees. *M. pluvialis*, also excepting the pear from its general attack, was commonly found in the interior, and *M. constricta*, an assailant of the oak and the prune, in the Pacific Coast States. On the Coast the Oyster-shell Scale combined with *M. erosa* to kill many wild crab-apples. *Eriosoma lanigera* was widespread in the Fraser Valley; *Syncta albida* was eating young developing apples and maturing cherries; the Pear Tree Blister Mite was in every orchard; both broods of the Pear Tree Slug, like *Myzus cerasi* and the Green Apple Aphis, merely checked excessive vegetation; and a slight infestation of the Lesser Apple Worm took place at picking time, especially on Crab, Spy, Gravenstein and King apples. *Corymbites inflatus* destroyed buds and blossoms of young apple trees in the Okanagan District; bud weevils affected apple buds. There was an outbreak of *Vanessa californica* in the Kootenay country; where, as in the Nelson District, a climbing cutworm gave much trouble, and despite the Paris green used against it in bran mixture, killed a number of young apple trees by girdling. Carbolic emulsion, applied early, has proved useful against the Cabbage Maggot in Vancouver. Elaterid larvae were working on potato tubers at Mission, and *Epochra canadensis* was attacking currants and gooseberries in Grand Prairie, as well as throughout the Western States and British Columbia. The author expects the San José Scale and the Codling Moth, the latter of which made a temporary appearance at Armstrong and was got rid of by the boiling of all the apples in the place, to invade British Columbia along the Okanagan Valley, and *Leptinotarsa decemlineata* from the Columbia River Valley, where it has reached Metaline Falls from Nez Percé, in Idaho.

Morstatt (H.). **Liste schädlicher Insekten.** [List of noxious insects (in German E. Africa).]—*Der Pflanzer, Daressalam,* ix, no. 6, June 1913, pp. 288-296.

In addition to various pantophagous Acridiidae and wood-boring Apidae the following is a list of injurious insects recorded in German East Africa:—

Orthoptera: *Mataeus orientalis*, Karsch—Ficus elastica; *Conocephalus nitidulus*, Scop.—sorghum, rice; *Madica verrucifera*,

Karsch—sisal; *Gryllotalpa africana*—herbaceous crops; *Gryllus* sp.—Ceara rubber, vegetables.

ISOPTERA: *Coptotermes amanii*, Sjöst., *Eutermes usambariensis*, Sjöst.—timber in buildings; *Termes natalensis*, Hav.—rubber trees; *Termes badius*, Hav.—coffee.

COLEOPTERA: *Oryctes monoceros*, Ol., *O. boas*, F., *O. cristatus*, Snell, *Temnorrhynchus sansibaricus*, Kolbe, *Tetralobus flabellicornis*, L., *Diocalandra frumenti*, F., *Rhynchophorus phoenicis*, F.—coconut.

Popillia hilaris, Kr., *Epilachna polymorpha*, Gerst., *E. matronula*, Wse., *E. similis*, Thb., *Syagrus puncticollis*, Lef., *Dicasticus gerstaeckeri* Fst., *Epipedosoma laticolle*, Klb., *Systates pollinosus*, Gerst., *Apion xanthostylum*, Wgn., *Alcides brevirostris*, Boh.—cotton.

Trogosita mauritanica, L., *Silvanus surinamensis*, F., *Laemophloeus pusillus*, Schh., *Tribolium castaneum*, Hbst., *T. confusum*, Duv., *Calandra oryzae*, L.—seeds and stores.

Epilachna polymorpha, Gerst., *E. matronula*, Wse., *E. similis*, Thb., *E. fulvosignata*, Reiche, *Lagria villosa*, F., *Callispa kilimana*, Klb., *Oides collaris*, Baly, *Hispa striaticollis*, F., *Systates pollinosus*, Gerst.—maize.

Idacantha magna, Wse., *Anthores leuconotus*, Pasc., *Nitocris usambica*, Klb., *Anatragus ornatus*, Klb., *Frea marmorata*, Gerst., *Coptops aedificator*, F., *Penhammus pauper*, Klb., *Pachydissus hector*, Klb., *Ceroplesis adspersa*, Pasc., *C. conradti*, Klb., *Araeocerus fasciculatus*, de G., *Phloeobius catenatus*, Klb., *P. pustulosus*, Gerst., *Dicasticus gerstaeckeri*, Fst., *Systates pollinosus*, Gerst., *S. irregularis*, Fst., *Rhadinoscapus nociturus*, Klb., *Xyleborus morstatti*, Haged., *X. aulmanni*, Haged.—coffee.

Lagria villosa, F., *Ceralces ferrugineus*, Gerst., *Oides collaris*, Baly, *Inesida leprosa*, F., *Sternotomis bohemani*, Chev., *Mallodon downesi*, Hope, *Systates irregularis*, Fst., *Polyrhabdotus transversalis*, Fst.—rubber.

Popillia hilaris, Kr.—wattle; *Epilachna canina*, F., *E. chrysomelina*, *Ootheca mutabilis*, Sahlb.—sesamum; *Phonapate porrecta*, Lesne.—African mahogany; *Bruchus sinensis*, L., *B. ornatus*, Boh., *Araeocerus fasciculatus*, de G., *Apion varium*, Wgn., *Apion fuliginosum*, Wgn.—cowpea; *Bruchus ornatus*, Boh.—Dolichos lablab; *Apion varium*, Wgn., *Ootheca mutabilis*, Sahlb.—beans; *Epilachna chrysomelina*, F.—Cucurbitaceae; *Mylabris amplectens*, Gerst., *M. difurca*, Gerst.—vegetables; *Colasposoma compactum*, Gerst.—sisal; *Diastocera reticulata*, Thoms.—kapok; *Tragocephala pretiosa*, Hintz., *Dicasticus gerstaeckeri*, Fst.—camphor; *Polyrhabdotus transversalis*—cacao; *Mecostylus vittaticollis*, Fst.—coca; *Systates irregularis*, Fst.—cinchona; *Cryptorrhynchus mangiferae*, F.—mango.

LEPIDOPTERA: *Lycaenesthes* sp., *Miresa* sp., *Thliptoceras octoguttale*, Fld., *Cemiostoma coffeellum*, Staint., *Gracilaria* sp., *Agrotis* sp.—coffee.

Prodenia sp., *Earias insulana*, Boisd., *Agrotis* sp., *Chaerocampa celerio*, L., *Sylepta derogata*, F., *Gelechia gossypiella*, Saund., *Pyroderces simplex*, Wlsm., *Gracilaria* sp.—cotton.

Eurytela dryope, Cram.—castor; *Papilio demodocus*, Esp.—citrus; *Busseola sorghicida*, Thur., *Diatraea orichalcocilliella*, Str., *Sitotroga cerealella*, Ol.—sorghum; *Deudorix antalus*, Hopf., *Mussidia melanoneura*, Regel, *Eucosma* sp. *Sitotroga cerealella*, Ol.—beans; *Amphicallia tigris*, Butl., *Ephestia figuliella*, Gregs., *E. cahiritella*, Z., *Setomorpha insectella*—maize; *Deilephila nerii*, L.—cinchona; *Glyphodes ocellata*, Hmp.—Kickxia rubber; *Leucinodes orbonalis*, Gn.—egg-plant; *Plutella maculipennis*, Curt.—cabbages.

Diptera: *Dacus cucumarius*, Sack, *D. brevistylus*, Bezzi, *D. bistrigatus*, Loew — Cucurbitaceae; *Ceratitis anonae*, Grah. — cacao; *Oscinella coffeae*—coffee.

Rhynchota: *Antestia variegata*, Thb., *Cryptacrus comes*, F., *Calidea bohemani*, Stål, *Sphaerocoris annulatus*, F., *Serinetha hexophthalma*, Thb., *Aphis coffeae*, Nietn., *Ceroplastes ceriferus*, And., *Lecanium viride*, Green, *Lecanium hesperidum*, L., *Asterolecanium coffeae*, Newst.—coffee.

Calidea apicalis, Schout., *C. dregii*, Germ., *Serinetha hexophthalma*, Thb., *Oxycarenus hyalinipennis*, Costa, *Dysdercus fasciatus*, Sign., *D. nigrofasciatus*, Stål, *D. superstitiosus*, F., *D. cardinalis*, Gerst., *D. festivus*, Gerst., *Helopeltis bergrothi*, Reut., *Chlorita facialis*, Jac., *Pseudococcus filamentosus*, Ckll., *Hemichionaspis minor*, Mask.—cotton.

Stigmacoccus zimmermanni, Newst., *Pseudococcus adonidum*, L., *Lecanium nigrum*, Nietn., *Aspidiotus destructor*, Sign., *A. transparens*, Green, *Selenaspidus articulatus*, Morg.—rubber.

Lygus trabeatus, Guer., *L. cuspidatus*, Kr.—cinchona; *Aphis rumicis*, L.—cowpea; *Aphis sorghi*, Theo.—sorghum; *Phacosema zimmermanni*—African mahogany; *Lepidosaphes beckii*, Newm., *Pseudaonidia trilobitiformis*, Green—citrus spp.; *Chrysomphalus aurantii*, L., *Aspidiotus cyanophylli*, Sign.—sisal, coconut; *A. destructor*, *A. transparens*, Green—coconut; *A. cyanophylli*, *A. destructor*—camphor; *Chrysomphalus aurantii*—tea; *Selenaspidus articulatus*, Morg.—date palm; *Pseudococcus filamentosus*, Ckll.—mango; *P. citri*—potatoes.

Feytaud (J.). **Cochylis et Eudémis; procédés de capture des papillons.** [Cochylis and Eudemis: methods of capturing the moths.]—*Bull. Soc. d'Étude et de Vulgar. de la Zool. Agric., Bordeaux*, nos. 2, 3 & 4, April, June & August 1913, pp. 33-41, 73-83, 97-104, 14 figs.

This paper should be read in connection with those of Dr. Dewitz and M. Marchal [*Cf.* this Review, i, Ser. A, pp. 5-10 and 70-73]. It begins with a statement as to the flights of *Clysia ambiguella* (*Cochylis*) and *Polychrosis botrana* (*Eudemis*), the former of which take place in May and July, the latter in May, July and September; in both cases the moths fly irregularly and low, following the direction of the vine rows and the flight lasts several weeks. A description of the various forms of sticky racquets in use is given, followed by that of an improvement upon them, consisting of a stretcher (brancard Bourchanin)

having on either side of the poles two panels of wire gauze, roofed above with the same material and so put together that when the stretcher is set down between two rows of vines, each of these is enclosed, above and along its sides, by the panels. Willow wands are then used to scare the moths from the vines, and they are caught on the panels, the inner surface having been smeared with the customary sticky substances. Larvae are often carried into the vineyard buildings during the vintage, and when the moths emerge they are caught by means of sticky paper pasted on the windows.

The author states that light ceases to attract these moths when it exceeds about 5-candle power. This is one reason why they avoid strong sunlight, which also carries with it more heat than they can bear and deprives them of the moisture necessary to their existence. On the other hand *Clysia* moths fly to lamps when the air is cool and damp, and M. Feytaud briefly describes several kinds: oil, petroleum and candle lanterns, set in a deep dish or over a smeared tray perched at the top of a pole or hanging from it, acetylene burners set in the middle of a large pan, and electric lamps hung over a dish partly filled with water and petroleum. It appears from the particulars given that, though electricity is cheap to work and its use can be regulated to a nicety, its primary cost is considerable, so that, like acetylene, it is practically beyond the means of the agriculturist. The proportion of females attracted by lamps and of those present in the vineyard has been found by several observers to be much the same (generally about 40 per cent., the bulk of which had not ceased laying), except on stormy nights, when the few insects taken were all males. As regards *Polychrosis*, which is affected by smell rather than colour, the author describes the results obtained by baits in the Gironde and the material to be chosen for the vessels used [*Cf.* this Review, Ser. A, i, pp. 9, 10], adding that these vessels should be shaped much like pails, since evaporation is too rapid in flat ones, that they should be enamelled inside, and that their efficacy is greatly increased by hanging them about 15 cm. below cheap little roofs, made of tarred cardboard or earthenware and shaped like billiard lamp-shades. These coverings keep out the rain, which would stop fermentation and dilute the bait. A liquid equal to more expensive baits can be obtained by mixing 1 lb. of molasses with 10 gallons of water and adding 1 lb. of wine lees to hasten fermentation. The vessels should be hung at the same height as the bunches of grapes. Illustrations show various ways of distributing them, and the author suggests having one every 2 yards at the ends of the rows, one every 10 yards along the inner rows and one every 5 yards along the outer rows. The reason is that the pails outside are easier to inspect, while they are also those most frequented by the moths. The baits attract many insects, useful and otherwise, as well as *Polychrosis*. *Chrysopa vulgaris*, though very rare during the May flight, is frequently taken in July; and where fermentation has been allowed to cease in the vessels, or they have been set before the general flight of the vine-moths, *Chrysopa* is destroyed more often than *Polychrosis*. As in the case of *Clysia*, the proportion of *Polychrosis* females caught, generally about

40 per cent., is the same as that of the insects flying among the vines, and the few captured in bad weather are chiefly males. These also predominate until the general flight, from which moment the females constantly increase till there are more of them than of males. Since there are hardly any but males at the beginning of the flight, and at the end the females have all laid, the most useful intermediate time for baiting, which does not exceed 15 or 20 days in certain years and 10 or 12 in others, can best be determined by the anatomical examination of specimens. The author, who gives a detailed estimate showing that the cost of baits is less than half that of lamps, goes on to say that it involves much less labour than the use of racquets. He concludes by stating that, though preventives and insecticides are really more effective, since they are less dependent upon weather conditions, capture is more popular among cultivators, both because it is easier of general application and because it produces more tangible results.

Vaile (R. S.). **A Tenebrionid Beetle injuring Beans.**– *Mthly. Bull. State Comm. Hortic., Sacramento*, ii, no. 7, July 1913, p. 591.

Although known for some years in southern California, *Coniontis subpubescens* has never been reported as doing damage until this season, when the adult beetles were found in large numbers, near Oxnard, feeding on the tender stocks of beans just after they came through the ground. The stand of beans was almost entirely ruined, the damage being more severe than that done by *Blapstinus* sp.; but it is not expected that the pest will spread, as the fields are isolated, and the beetle is easily poisoned by cutworm baits.

Smith (H. S.). **The introduction of *Calosoma* for use against the Oak Moth.**—*Mthly. Bull. State Comm. Hortic., Sacramento*, ii, no. 7, July 1913, p. 590.

The damage done by *Phryganidia californica* in its native State, and especially in the Santa Clara valley, had, during June 1913, often attained to complete defoliation of the oak trees, and much more was feared from the second brood. It was therefore decided to obtain a supply of *Calosoma sycophanta* from New England, where it had proved very successful against the gypsy moth. This large green beetle will find in California a climate similar to that of its native Southern Europe, and will have as its food, in addition to more than one generation of the oak worm, the fall web-worm, several species of tent caterpillars, several tussock moths, the canker worms and the red-humped caterpillars. The fact that the larvae of *C. sycophanta* are good tree-climbers enables them to reach the oak leaves which it would be almost impossible to spray.

Cook (A. J.). **Arsenate of Lead *versus* Paris Green.**—*Mthly. Bull. State Comm. Hortic., Sacramento*, ii, no. 7, July 1913, pp. 590-591.

The soluble nature of Paris green and London purple often renders these substances injurious to leaves, and Gillette's remedy of mixing them with 4 or 5 to 1 of unslaked lime involved more work and was sometimes unsatisfactory. On the other hand arsenate of lead, even in the strength of 4 lb. to 100 gals. water, is harmless, while the powder can be mixed, pound for pound, with dry wood ashes. The powder should be applied with a dust gun in calm weather, when the plants are wet with dew.

Essig (E. O.). **The Branch and Twig Borer.**—*Mthly Bull. State Comm. Hortic., Sacramento*, ii, no. 7, July 1913, pp. 587- 589, 1 fig.

The damage done by *Polycaon confertus*, Lec., consists in clean round burrows in the branches, extending into the pith or even through to the other side, the insects beginning in the axil of a bud or small branch and boring downwards. Small twigs are so weakened that their weight breaks them, and the tunnels in larger branches provide hibernating quarters for other pests and opportunities for the entrance of fungi and decay organisms. The damage is done by adults alone, which appear and disappear suddenly, in spring and early summer. It is supposed that they lay in live oak, in which adults have been reared from larvae, but from this native host they have already spread to the almond, apple, apricot, cherry, currant, fig, grape, olive, orange, peach and pear. The Californian counties in which it has been found, so far, are Alameda, Butte, Calaveras, Contra Costa, El Dorado, Napa, Riverside, Sacramento, Santa Clara, Santa Cruz, Tehama, Ventura and Yolo. Burning the infested twigs and destroying the insects in the burrows, by means of a short wire or knife blade, are the only remedies in use at present.

Branigan (E. J.). **A New Host Plant of the California Grape-Root Worm.**—*Mthly. Bull. State Comm. Hortic., Sacramento*, ii, no. 7, July 1913, pp. 585-586.

During an investigation in the high Californian Sierras into the hibernating quarters of *Hippodamia convergens*, Guér., the author found the leaves and roots of *Saxifraga peltata*, Torr., greatly damaged by *Adoxus obscurus*, of which a few adults were discovered, in spite of the lateness of the season.

Harned (R. W.). **Insects affecting Melons, Cucumbers and Squash.** —Press Circular, *Mississippi Agric. Experim. Station*, July 1913, 1 p.

The author enumerates, as insects that suck out the juices of the leaves and cause them to curl up and wilt, *Aphis gossypii*

and *Anasa tristis*, and, as feeding upon the tissues, *Diabrotica vittata*, *D. 12-punctata*, *Epilachna borealis*, *Melittia satyriniformis*, *Diaphana hyalineata*, and *D. mitidalis*. All vines and leaves of melons, "squashes" and cucumbers—the same insects attack all these plants—should be deeply ploughed under immediately after gathering the crop, and autumn and winter ploughing and harrowing helps to destroy the insects. Rotation of crops should take place annually, no cucurbits being planted in the neighbourhood meanwhile. Early varieties, and if distinguishable, those least subject to attack, should be sown early and thickly: quick-acting fertilisers should be liberally applied; and rows of early squashes, to be sown at intervals of two weeks so as to supply constant young plants, should be planted at intervals to lure the insects from the cucumbers and melons and to serve as traps, on which and on other plants, especially in July and August, infested blooms, as well as all insects, should be destroyed. Frequent and thorough spraying with a mixture of 1 lb. lead arsenate paste to 10 galls. water is recommended; and for borers the covering of the vines with soil one or two feet from the base, to produce secondary roots, and the slitting lengthwise of the vines where the borer is at work, thus killing it and not the plant.

Pastre (Jules). **Le Sporotrichum et les Chenilles bourrues.** [*Sporotrichum* and *Arctia caja.*]—*Bull. Agric. de l'Algérie et de la Tunisie, Algiers,* 1st July 1913, pp. 283-284.

In the vineyards of Hérault, the larvae of *Arctia caja* are often found dead or in a swollen and flabby condition. These latter soon die, and remain distended after death, being filled with a whitish substance, which grows and makes its appearance on the skin and hairs. This has been recognised by M. Henri Sicard as the fungus *Sporotrichum globuliferum*, which the moisture has enabled to attack the insect this year, thus supplementing the work of *Apantales caja*, *Degeeria funebris* and *Erynnia vibrissata*. Experiments are being made with the object of propagating the fungus artificially, but with slender results so far; indeed, it appears only to have affected the first generation of larvae.

Ruby (J.). **La lutte contre la mouche de l'olive.** [The struggle against the Olive fly.]—*Bull. Agric. de l'Algérie et de la Tunisie, Algiers,* 15th July 1913, pp. 292-296.

Further experiments on the banks of the Berre pool have confirmed the results previously obtained, viz., that sprays of diluted sugar molasses, mixed with alkaline arsenate, are very effective against "keïroun," as the larva is called, but that poisoned baits, either in bags filled with impregnated sawdust, or in dishes, have no appreciable value. The same grove was chosen as before, as it is large, isolated and likely to be attacked by *Dacus*, as it was everywhere in 1912, owing to its proximity to the tank and the number of "Saurine" trees (specially liked by the insect) in the

most sheltered part. The spray was composed of 30 lb. of molasses, to which 2·5 per cent. of sodium arsenate had been added, and of 20 gallons of water. It was used for the first time on the 8th July, when the fruit were quite small and there were no signs of any insect. With an ordinary sprayer a man was able to treat from 700 to 900 trees per diem, only ½-⅔ pint being required for each. By the end of August the rains had washed off all the spray, and since many olives had been attacked elsewhere and the majority contained pupae, the selected olive grove was sprayed again on the 6th September to protect it against the coming brood of flies. On the 5th October the sprayed parts of the grove gave 4·3 per cent. of attacked trees, as against 41·3 per cent. in the rest; and on the 5th November, while the crop was being gathered, the percentage attacked was 8·4, as against 77·9. The necessity of keeping up the treatment has been shown in a grove at Logis-Neuf, where less than 10 per cent. of the trees sprayed in 1910 and 1911 were attacked, as compared with over 60 per cent. of the controls; whereas in 1912, when neither set of trees was sprayed, the percentages became 72 and 75 respectively. Besides the premature fall of the fruit, *Dacus* brings about a smaller yield of oil; and it was found that three double decalitres of sprayed olives gave 10 litres of oil, a quantity which it took five double decalitres of unsprayed fruit to produce; and as spraying only costs from 2*s.* 4*d.* to 3*s.* 4*d.* an acre, the result amply justifies the expenditure. The author, recapitulating the facts given above, adds that in places like Corsica and the Maritime Alps, where the crop is tardy, a third spraying in the autumn is advisable.

Feytaud (J.). La Vanesse du Chardon et de l'Artichaut—*Vanessa (Pyrameis) cardui*, L. [The Vanessa of the Cardoon and the Artichoke.]—*Bull. Soc. d'Etude et de Vulgar. de la Zool. Agric., Bordeaux*, August 1913, pp. 109-114, 1 fig.

The author recapitulates the evidence of Messrs. Tschaën ("Un parasite de l'Artichaut," *Progrès agricole de Montpellier*, 20th July 1913) and Vidal (Société Nationale d'Agriculture, 9th July 1913) as to the attack made this year by *Pyrameis cardui* upon the artichokes in the district of Hyères. The larvae, hundreds of which were found on each plant, destroyed whole plantations in a few days, eating all the green parts and leaving only the larger veins of the leaves and the flower-stems, and passing in a body from one field to the next as soon as they had stripped it. The author recalls a similar devastation of the artichoke crop at Hyères in 1880, and at Blanquefort and Parempuyre, north of Bordeaux, in May and June 1906. He recounts the various records as to migrating swarms of this butterfly, and gives a list of its food-plants, which are numerous. In 1906 Prof. Boyer successfully used nicotin and lead arsenate sprays, but the latter can only be applied before the flower-stalk develops. At Hyères this year insecticides proved a failure, but that was probably because they were used too late. Every pupa examined was found to have been attacked by Chalcididae.

Garcia (J. N.). **Problemas agricolas por los trigos de Castilla.** [Wheat Pests in Castile.]—*La Ciencia Agricola*, iii, no. 45, 15th July 1913, pp. 2-4.

The author says that wheat pests have done much damage in the district of Campos and have caused considerable alarm to farmers. One of these is a Pentatomid bug, probably *Aelia acuminata*, L. ("Sanpedrito") which, according to A. G. Romero, also occurs at Tordesillas. The insect attacks the grain of wheat in the ear when it is tender, sucking the juice and greatly interfering with its growth. Any grain that may not be attacked is practically spoiled for food purposes, as it carries the characteristic offensive odour of the insect. The author says that really effective insecticides have to be used in such a strength as to damage the plant and that they are not to be recommended. If the foci of attack are relatively small, it is best to isolate them by an open ditch which may be filled with dry grass or straw on which the insects will collect in their attempts to pass and which may be burned. The Marquis of Solana, chief of the Agricultural Service of the Province of Valladolid, after visiting Tordesillas, confirms the identification of this insect as *Aelia acuminata*, L. (*rostrata*, de G.) and says that it is known in Andalucia and Palencia. The imago does not appear until the end of May, and it would seem that the eggs are laid eight or ten days afterwards, at the earliest, in the wheat stalk. The insect remains in the ear in the morning, and during the heat of the day the infested corn should be shaken into a funnel to which a bag is attached (like that used in vineyards, and capable of being strapped to the waist of a man or boy), when great numbers of the pest will fall out of the ears. This method is undoubtedly successful, but isolation and burning of the foci, first sprinkling them with gasolin, gives quicker results if applied early.

A. Ortega reports that in Castile a species of grasshopper does considerable damage to wheat during the latter half of May and the beginning of June, working in concentric circles and attacking the more developed and earlier cornfields, especially those on compact, clayey soil. The destruction done by it lasts from 10 to 12 days, according to the weather. The imagos collect in large numbers during the evening and settle in clusters in uncultivated spots, such as the borders of fields, hedges or pastures, but not in stubble, and here lay their eggs. Its development, and the harm done by it, are much the same as in the case of the locust. The remedies suggested are the breaking up or burning off, in September, of all uncultivated areas in the infested district, and the multiplication of birds in every possible way, such as limiting their destruction by man and birds of prey and increasing the number of trees.

La situation viticole en France. [The condition of the French vineyards.]—*Bull. Bi-mens. du Gouvernement Général de l'Algérie, Paris*, nos. 14 and 17, 15th July and 1st Sept. 1913, pp. 230-231 and 289-291.

In an epitome of the official reports (no. 14) on the vineyards in different Departments in France, it is stated that on the 1st of

July *Clysia ambiguella* was abundant, and caused serious anxiety, in Allier; it had been observed in various parts of the Gard; there was a little of it in the Haute-Garonne; an invasion was feared in the Puy-de-Dôme; a serious incursion had taken place in the Tarn-et-Garonne; and it abounded, as did also *Polychrosis botrana*, *Pyralis* and *Haltica*, in Hérault, where insecticides were being freely used. Further reports (no. 17) state that it was not yet certain whether a second generation of *Clysia* and *Polychrosis* would become dangerous in the Aude. Both insects had appeared all over Aveyron and had recently increased considerably. *Clysia* had attacked the Corrèze vines, but had done little damage so far. Many growers were preparing to use nicotin in Maine-et-Loire against an expected second generation; in the Dordogne it was already being tried for the same purpose, the vines being clipped and sprayed with sulphur meanwhile. The moths, against which lamps were being used in various places, had spread over the whole region of the Marne.

Un insecte ennemi du blé. [An insect pest of wheat.]—*Bull. Bi-mens. du Govt. Général de l'Algérie, Paris,* no. 15, 1st Aug. 1913, p. 248.

In a summary of a paper read by M. Vermeil before the Oran Agricultural Society, the Bulletin states that *Aelia acuminata*, called "moutebeg" by the natives, has done great damage this year in the Saïda, Tiaret and Bossuet districts, while in the Tell, where it finds other food, it is not so destructive to wheat. On the high table-lands it hibernates under tufts of Alpha grass (*Macrochloa tenacissima*), and does not attack cereals—of which it is only an accidental, though sometimes a dangerous, parasite—until the *Macrochloa* becomes too dry to afford it sufficient food. It then fastens upon the grains of wheat in the milky stage, pierces them with its rostrum and pumps out the contents. Where the rows are far enough apart, a man can collect the insects by passing a net over the ears, and can thus treat from six to seven hectares (15-17 acres) a day; but no scientific means for their destruction has as yet been devised.

Jack (Rupert W.). **Borers in Native Timber. Results of Experiments with Preservatives.**—*Bull. no.* 154, *Dept. Agriculture, Salisbury, Rhodesia,* August 1913, pp. 2-7, 2 plates.

In order to furnish information as to the treatment of the wood-boring beetles attacking msassa (*Brachystegia randii*), mtondo, mfuti, mahobohobo, etc., especially in the warm, damp galleries of the mines, the author treated a number of tree lengths in various ways in August 1910. Soaking for 24 hours in sodium arsenite, whether its strength was 2½ lb., 5 lb., or 10 lb. to 10 galls. of water, secured immunity; Cooper's Sheep Dip—1 packet to 25 gallons, tried both for 24 and 68 hours—reduced the holes to a minimum, as did also 24 hours in Jeyes' Fluid (1 to

100), and 24 hours in a mixture of 64 oz. crude carbolic acid, 1 oz. caustic soda and 4 galls. water. A like effect was produced by a double coating of coal tar, both when applied cold and at 180° F. Practically no protection was given by any of the following dressings: Jeyes' Fluid, 1 to 10; the mixture of crude carbolic, caustic soda and water, when the carbolic was reduced to 6·4 oz.; double coats of Stockholm tar (whether cold or at 180° F.), of pure Jeyes' Fluid, crude carbolic, or carbolineum, all at 180° F., or of solignum, at either temperature; white or red lead, or a mixture of 4 oz. of the latter with 1 oz. of white arsenic, even when two coats were applied; or by 4, or even 8, weeks' soaking in water or in brine. The use of sapolin varnish resulted in very few holes, even when put on only once; but the author thinks this may be ignored, as elsewhere a thorough dressing of carbolineum, coupled with varnishing, proved ineffectual.

The author concludes that for outdoor purposes a solution of arsenite of soda, supplemented by a coating of hot coal tar when there is exposure to the weather, is advisable, especially as both are very cheap locally; but indoors, as it is problematical whether a coating of varnish would prevent arsenical fumes, coal tar should be resorted to. Thorough drying, to ensure maximum penetration, is insisted upon, and a doubt is expressed whether this was sufficient in some of the experiments which did not turn out better, such as that of Cooper's Dip; though the only partial success of this may have been due to too small an admixture. The effect of a larger proportion of soluble arsenic has been shown by a 400 gallon five-day dip of 8 lb. sodium arsenite, 5½ lb. soft soap and 2 galls. paraffin, which instantly stopped the work of borers in tobacco sticks thrown into a cattle-dipping tank—a very useful appliance for soaking—and, after a week in the dip, kept them from being attacked again.

Vuillet (A.). **Ravages du Bostriche bidenté dans la Marne.** [Damage to Austrian pine in the Marne by *Pityogenes bidentatus*, Herbst.]—*La Revue de Phytopathologie Appliquée, Paris*, i, no. 8, 20th Sept. 1913, pp. 111-112.

Certain plantations of *Pinus austriaca* in the department of the Marne have suffered seriously in the present year from attacks by a minute beetle, *Pityogenes bidentatus*, Herbst. The author says that this insect is not merely one of the most serious enemies of the black pine but of all other species of pine cultivated in France. It appears to confine its attack to trees between 5 and 10 years old, boring galleries in the smaller branches immediately beneath the bark. It can be more or less successfully met by the judicious use of "trap branches," that is to say, by leaving in the forest after the spring cutting, certain cut branches on which the insects will oviposit. These branches are collected and burnt in May. The species has at least two generations in the year, and as the development is irregular and more or less continuous it is well to renew these trap branches every month. Another species *P. quadridens* also damages pines in the same way and can be met by the same methods.

Vuillet (A.). **Les vers des Écussons de Rosiers.** [A Maggot attacking grafted rose buds.]—*La Revue de Phytopathologie Appliquée*, i, no. 8, 20th September 1913, p. 112.

The writer says that in the month of August he received from the neighbourhood of Angers specimens of *Rosa canina* which had been budded 3 weeks previously and the "buds" of which were eaten by minute red maggots. He is of opinion that they were the larvae of *Clinodiplosis oculiperda*, Rübs. This Cecidomyid does not appear to have been noted before in France as an enemy of rose trees, but it is known to have frequently caused considerable damage in Germany. The perfect insect is to be met with from the middle of June to the middle of August. The female lays 6 to 12 eggs on each "bud." It also attacks other plants, *e.g.*, fruit trees. The author says that it is well, in place of the usual raphia grass used to fasten the grafted buds, to employ woollen or cotton thread previously soaked in turpentine to which a small quantity of naphthalin and linseed oil has been added. These threads should be very carefully dried before being used. Grafts made near the surface of the soil can be efficiently protected by earthing up.

Vuillet (A.). **Deux ennemis du Cocotier de la région Malgache.** [Two enemies of the coconut-palm in the Madagascar region.] —*L'Agronomie Coloniale, Paris*, no. 2, 31st Aug. 1913, pp. 33-37, 1 pl.

The Lymexylonid beetle, *Melitomma insulare*, Fairm., appears to be abundant in the Seychelles, where it has been observed by M. Rivalz Dupont (Cf. "Contribution à l'étude du cocotier aux Seychelles," Mahé, 1912), towards the end of the year. The female lays on the trunks of coconut palms, near the ground, wherever the bark has been injured. The young larva, called "petit moumouc" in Seychelles, makes its way into the tree by means of a horizontal gallery, which becomes vertical when it reaches the soft parts within. The larvae may be very numerous and bring about decomposition of the tissues, rapidly followed by the death of the tree. If the foot of the tree be examined, the larvae will be found within the bark, amidst a reddish powder. The insect has also done considerable damage in the island of Berafia, north-west of Madagascar. The trees should be watched, the diseased parts cut out and burned on the spot and the wounds covered with a layer of coal tar. If the damage has gone too far the tree should be cut down, to prevent it from becoming a centre of infection. Prevention is limited to the avoidance of orifices in the bark. Many of these are due to superfluous roots above ground, which, on decomposition, leave openings into which parasites make their way. These roots can be prevented by careful cultivation and weeding, by filling up the cavities hollowed out near the trees by tropical downpours, etc. Coal tar, moreover, while it will keep away the females and prevent them from laying in the tree, will help to heal any wounds there may be in the bark.

A large weevil, *Rhina nigra*, Drury, was found by M. Quesné invariably to attack the coconut palms in Berafia at about 5 feet above ground, not taking advantage of the damage done at the foot of the trunk by *Melitomma*. The female lays in a little cavity in the bark, which she makes with her rostrum, and the larvae penetrate into the harder parts of the wood, in which they hollow out numerous galleries. Prevention is the best weapon against this insect. Everything must be done to avoid damage to the bark, and unavoidable wounds should be given a layer of coal tar. If the eggs are laid in a definite part this can be protected by insecticides, such as thick milk of lime to which 1 lb. of lead arsenate per 10 gallons has been added. At Berafia the eggs were scraped away and coal tar applied. Trap trees, so cut as to ensure the fermentation of the wood, are useful, as these are chosen for oviposition and it is afterwards easy to destroy the larvae by boiling water or other means.

Urich (F. W.). **Entomologist's Report, Trinidad.**—*Minutes of Meetings of Board of Agric.*, no. 7, 15th Aug. 1913, p. 41.

The author says that cacao beetles (*Stirastoma depressum*), which are found all over Trinidad, do more damage in the south than the north, where there are sporadic attacks in shadeless spots swept by the wind. He suggests trapping the adult insects, cutting out larvae, shading by figs or immortelles and spraying or painting the branches with lead arsenate. Another Longicorn beetle, *Oncideres tesselatum*, has been found to cut off the branches of pois doux, as well as of Saman trees. As eggs are laid in the parts cut off, these should be burnt.

Weldon (G. P.). **The Fruit-tree Leaf-roller.**—*Mthly. Bull. State Comm. Hort., Sacramento*, ii, no. 9, Sept. 1913, pp. 637-647, 5 figs.

There have been cycles of good and bad years in Colorado, New Mexico, New York and other Eastern States with regard to *Archips argyrospila*, Walk. (the Fruit-tree Leaf-roller). It may, after being unperceived for years, suddenly develop into an important pest, and in the sequel be practically eradicated by parasites. The eggs are laid in mosses, on bark and on posts, barns, walls, etc., in late June and early July; the larvae hatch in time to feed on the bursting buds, leaves and fruit in the spring; pupation takes place, within a month, inside the rolled leaf, and the imago appears in about ten days. The insect feeds on the apple, plum, cherry, pear, currant, gooseberry, raspberry, rose, poplar, elm, locust tree, alfalfa, onion and other plants. It destroys the tender blossoms, eats the fruit and foliage, and, as it often leaves no fruit buds, causes the loss of the succeeding season's crop. Lime and sulphur are useless against this pest.

The eggs should be destroyed in winter by soluble oil sprays penetrating the coating of the moss, 1 gal. of Scalecide, Carboleine or Target Brand to 19 gals. water being used, and 6 to 10

gals. per tree applied. Thoroughly drenching with 3 lb. lead arsenate to 50 gals. water or 1 part "Black Leaf 40" to 800 parts water, will kill the young larvae just after the leaves come out in the spring. Apple trees should be drenched again just before blooming and after the buds have separated, and a third time when 90 per cent. of the petals have fallen and before the calyx cups close. This third drenching is also effective against the codling moth. Later sprays are useless.

Maskew (F.). **A Constant Menace.**—*Mthly Bull. State Comm. Hort., Sacramento,* ii, no. 9, Sept. 1913, pp. 653-654.

The discovery of a number of specimens of *Sphenophorus (Rhabdocnemis) obscurus*, Boisd. (the Hawaiian Sugar-cane Borer), at San Francisco, in a crate of pineapples sent from Honolulu, gives the author an opportunity of pointing out that the Mediterranean fruit fly might just as easily have been in the crate as these weevils, which do not attack pineapples, and doubtless merely entered it as a hiding-place. Pupae of the fruit fly have been found in all sorts of unlikely places, such as the seams inside gunny bags that had contained bell peppers, and the author suggests that no products from Hawaii should be admitted into California unless accompanied by an official record that from the time of cutting, through all processes of packing, hauling and storing, they have not been in the immediate vicinity of any material infested by the fly.

Vosler (E. J.). **The Red-humped Caterpillar.**—*Mthly. Bull. State Comm. Hort., Sacramento,* ii, no. 9, Sept. 1913, pp. 654-657, 4 figs.

Schizura concinna, S. & A. (the Red-humped Caterpillar), is found throughout the United States, and is common in Central California. Its food-plants are the apple, hawthorn, prune, plum, cherry and walnut. The imago lays on the leaves in May, June and July; the larvae are most abundant in June and July, after which, up to September, they pupate in the ground or under rubbish, and the adult emerges in late spring and early summer. Hand-picking, and a spray of 5 lb. lead arsenate to 100 gals. water, are recommended. *Apanteles* sp. and *Limnerium* sp. parasitise the larvae, and it is hoped that *Calosoma sycophanta*, recently imported, will assist in reducing them.

Essig (E. O.). **The Fruit-tree Bark-beetle.**—*Mthly. Bull. State Comm. Hort., Sacramento,* ii, no. 9, Sept. 1913, p. 658.

The first appearance of *Scolytus rugulosus*, Ratz. (the Fruit-tree Bark-beetle), in California has been reported from Ontario. It was found there upon apricot trees, but it also attacks the plum, pear, peach, apple and cherry. It breeds in weak trees and

spreads to healthy young ones, boring into the tips of young branches in the spring. Badly infested trees or branches, with all dead wood, should be burnt; young trees should be protected, in October or November, by whitewash, Bordeaux paste, or a thick soap wash containing 1 pint crude carbolic acid to every 10 gals.; and the trunk and limbs should be sprayed with a mixture of 3 lb. naphtha soap, which, after being dissolved in 3 gals. boiling water, has had 1 gal. carbolineum well shaken up with it and has then been diluted with 4 gals. water. Those using the spray should be protected against the carbolineum.

Essig (E. O.). **The Codling Moth attacking Walnuts.**—*Mthly. Bull. State Comm. Hort., Sacramento,* ii, no. 9, Sept. 1913, p. 659.

Soft-shelled Santa Barbara walnuts have been attacked by codling moths along the foothills near Carpinteria, in California. Already, in 1909, this insect had been found in Contra Costa County to attack, besides apples, pears, peaches, plums and chestnuts, the Mayeth, Franquetta, Parisienne and Concord varieties of walnuts, burrowing through the green hull at the stem end, and feeding on the kernel. The later broods attack the walnuts, in which they appear in August and September; they hibernate inside them or on the shells, and the adults emerge in April and May. Spraying against the earlier broods in apples, pears, etc., destroying culls and windfalls of pears, which are breeding places for the walnut brood, and spraying the walnuts in August, are the remedies suggested.

Compere (G.). **A new beginning in the Importation and Establishment of Beneficial Insects.**—*Mthly. Bull. State Comm. Hort., Sacramento,* ii, no. 9, Sept. 1913, pp. 660-661.

The author observes that since the red, purple, and black scales and citrus mealy bugs are held in complete subjection by natural checks in the Eastern States, the steps being taken to import these checks into California may be expected to prove as beneficial as was the introduction of *Vedalia*, the exterminator of *Icerya purchasi*, from Australia.

Vosler (E. J.). **A new Parasite of the Black Scale.**—*Mthly. Bull. State Comm. Hort., Sacramento,* ii, no. 9, Sept. 1913, pp. 661-662.

The presence in California of a number of adults of *Zalopothrix* sp., a consignment of which was received from the West Indies, leads the author to hope that this parasite will prove effective against the immature forms of *Saissetia oleae*, Bern. (the Black Scale). In this *Scutellista cyanea* fails, for its larva leaves enough eggs of the scale to enable it to reinfest an orchard, and does not act until the young scales have had time to suck the sap.

Essig (E. O.). **The Potato Tuber Moth.**—*Mthly. Bull. State Comm. Hort., Sacramento*, ii, no. 9, Sept. 1913, pp. 665-666, 1 fig.

The potato-tuber moth has been threatening California, as well as the States of Oregon and Washington, and the author suggests that no infested potatoes should be sent to any point within or without the State, that seed potatoes should only be obtained from districts known to be entirely free, and that they should be thoroughly inspected before planting.

Maskew (F.). **County Horticultural Commissioners and State Quarantine Guardians.**—*Mthly. Bull. State Comm. Hort., Sacramento*, ii, no. 9, Sept. 1913, p. 670.

The agreement of the County Horticultural Commissioners to co-operate with the State Office, says the author, will create an impregnable wall of protection in the State, through which no infested shipments can pass. To this end prompt information as to imported horticultural products at interior points should be sent to the Central Office, which will afford information as to insect pests and their hosts in the world at large, and the laws enacted for the protection of the country.

Lonyay (F. de). **Viticulture in Hungary.**—*Mthly. Bull. of Agric. Intelligence and Plant Diseases, Rome*, no. 8, Aug. 1913, pp. 1142-1149.

The first appearance of *Phylloxera* in Hungary took place in 1875, at Pancsova and elsewhere in the south, and, though the affected vines were at once uprooted, the pest spread throughout the country after 1880. Up to 1884 the area planted increased faster than that laid bare, but from the following year the pest began to destroy more than could be replaced, and by 1894 the 1,050,978 acres of 1875 had dwindled to 606,150 acres. A subsequent recovery raised the total, in 1911, to 883,924 acres, of which, in Hungary proper, 259,350 acres contained vines grafted on American stocks, 99,889 acres had been treated with carbon disulphide, 94,317 acres had compact soil and 317,222 acres were sandy. The chief remedies in use are grafting on American stocks, the yearly use of carbon disulphide and planting in sandy soil. There is much of this soil in Hungary, and *Phylloxera* has made its value known. The introduction of American direct bearers found little favour, and it proved impossible, owing to the hilly character of most old vineyards, to resort to flooding. The Government has given much assistance in various ways, providing carbon disulphide and giving instructions for its use, promoting the establishment of nurseries, and facilitating loans on advantageous terms.

Dalmasso (G.). **Un microlepidottero ampelofago poco noto.** [A little known vine-eating Microlepidopteron.]—*Riv. di Vitic. Enologia ed Agraria, Conegliano*, xix, no. 19, 1st Oct. 1913, pp. 443-445.

Commenting upon a monograph by Picard in the "Progrés agricole," the author says that the larvae of *Cacoecia costana*, F., feed on a number of plants peculiar to marshy ground, but also, when the soil is damp, as after flooding against *Phylloxera*, on the vine, which they damage much in the same way as *Sparganothis*. They appear at the beginning of spring, when the plants first germinate, gnaw the tender parts and envelop the leaves and young shoots in silken threads. They pupate about the beginning of May and the moths appear in the latter half of the month. A second generation, which greedily devours the leaves and sometimes cuts the peduncles of the fruit, appears in June in the South and in July-August in the North. Another brood emerges about the end of summer, and the larvae from these hibernate till the spring. Tachininae and Ichneumonidae parasitise the larvae, which are protected against sprays by their silken covering. The best remedy is the removal of infected shoots at the beginning of germination. Scalding, so commonly used against *Sparganothis*, is ineffective against *Cacoecia*, as it quickly spreads to the vines from other plants near them.

Webster (F. M.). **The Western Corn Rootworm.**—*Bull. no.* 8, *U.S. Dept. Agric., Washington, D.C.*, 27th Sept. 1913, pp. 1-8, 5 figs.

The author states that *Diabrotica longicornis*, Say (the Western Corn Rootworm) differs in several respects from *D. duodecimpunctata*, Oliv. The eggs are laid in late August and in September, the larvae hatch out in May and June, pupate in the soil and emerge as adults in late July and August. The insect was observed in Arkansas Territory in 1823, and in 1866 it was again noticed in Kansas, living on sorghum and on a large species of thistle. It had previously been found on flowers in Central Illinois. In 1874 and 1878 it was seen at Kirkwood and Eureka, Mo., respectively, burrowing in maize roots in the former instance. In Illinois it was rare in 1874, but in seven or eight years it had grown so abundant that maize could no longer be grown without a rotation to wheat, oats, barley, rye or some other crop of small grain, a change eliminating the pest, except in a very few instances, as yet unexplained. Since 1882 much damage has been done by the insect at La Fayette, Sunman, and other places in Indiana. Thus, from 1874 to 1902, it took possession successively of Illinois, Indiana and Ohio, in 1911 and 1912 it was at Duck River, in Central Tennessee, and in 1913 it had reached Chattanooga. It appears to be going down the rivers flowing through the Southern Atlantic and Gulf States; and so far, though it extends from Nova Scotia to southern Minnesota and South Dakota, and to Alabama and southern New Mexico, the greatest damage done by it has been in Illinois, Indiana, Ohio,

Iowa, South Dakota, Nebraska, Missouri, Tennessee and probably Kentucky. Since the species has long existed in, and even now extends to, regions where it does no damage, the author is of opinion that the harm is done by a special race feeding on maize silk and pollen; and he believes this race to have originated in the prairie country in Illinois. Up to 1862 the chief crop there was spring wheat, but maize was then substituted as food for pigs, for which the Civil War created a great demand, and rotation of crops was abandoned. The beetles may gradually have been attracted from other plants by the resulting pollen and silk, which is their chief food in the maize fields, where they swarm in the ears during summer and early autumn, while the larvae work in the roots during June and July. The imago sometimes feeds on the leaves, but it only eats the unripe kernels when they have been pecked by birds, and it also only attacks ripe apples when the skin has been broken. It feeds, outside maize fields, on thistle, sunflower, goldenrod, cucurbit, cotton, clover, rose, evening primrose, aster, and smartweed pollen, on the spores of fungi, and on the leaves of cucumber and beans. The flooding of the land in which the eggs have been laid does not appear to affect them, and their diminution by *Chordeiles virginianus*, *Myiochanes virens*, *Sporotrichum globuliferum*, or by *Celatoria diabroticae*, and the larvae of *Drasterius elegans* (the Click-beetle) is not very extensive.

Webster (F. M.). **The Southern Corn Rootworm, or Budworm.**—*Bull. no.* 5, *U.S. Dept. Agric., Washington, D.C.*, 27th Sept. 1913, pp. 1-11, 2 figs.

Diabrotica duodecimpunctata, Oliv. (the Southern Corn Rootworm) is found east of the Rocky Mountains from Southern Canada to North Carolina, Tenessee, Arkansas and Oklahoma. Like *D. vittata*, F., it collects in the blossoms of "squashes" and pumpkins, and late in summer and during the autumn it also frequents the various species of *Solidago* (Golden Rod). The imago eats almost any cultivated plant, including maize, wheat, oats, rye, barley, alfalfa, cowpea, soy bean, clover, etc.

Larvae and pupae have been observed at the roots of maize, wheat, oats, rye, garden beans, *Panicum miliaceum* (millet), *Bromus unioloides* (southern chess) *Rudbeckia* sp. (golden-glow), sedges of the genera *Cyperus* and *Scirpus*, *Datura stramonium*, *Sorghum halepense* (Johnson grass, Aleppo millet grass), *Amaranthus* (pigwood), *Echinochloa crus-galli* (cocksfoot grass) and alfalfa.

The insect hibernates as an adult northward of Brownsville, Tex., where oviposition takes place in the latter half of January. There appear to be two generations wherever hibernation takes place, but further south, where it does not, there may be only one. The egg period in different places varies from 7 to 24 days, the larval from 15 to 35 and the pupal from 7 to 13. The eggs are pushed down into the soil, which is generally that of the low and damp parts called "black lands," and the larvae make their way beneath the soil from one plant to another, grooving the roots and underground stems, and sometimes perforating the base

of the plant and destroying the central leaves. The insect thus keeps out of reach of attack, and rotation of crops appears to be no remedy for it, so that the only effective check—for *Celatoria diabroticae*, Shim., is too rare to parasitise the adult to any extent and it is only a conjecture that *Dasterius elegans*, F., feeds on the budworm—is to time planting so as to bring the young maize above ground after most of the eggs have been deposited, but not late enough to be attacked by the second generation, which is abroad in late June and early July in Northern Georgia, and in July in Northern Indiana. In the South, where the pest extends to the Gulf and into Mexico, the crop is always damaged early in the season, viz., in March or April, and to the northward up to May.

The author states that the insect has been found in the stomachs of the bobwhite, *Colinus virginianus;* scaled quail, *Callipepla squamata*; California quail, *Lophortyx californicus*; Prairie chicken, *Tympanuchus americanus*; wild turkey, *Meleagris gallopavo*: yellow-bellied sapsucker, *Sphyrapicus varius*; red-headed woodpecker, *Melanerpes erythrocephalus*; nighthawk, *Chordeiles virginianus*; scissor-tailed flycatcher, *Muscivora forficata*; kingbird, *Tyrannus tyrannus*; phoebe, *Sayornis phoebe*; wood pewee, *Myiochanes virens*; western flycatcher, *Empidonax difficilis*: Acadian flycatcher, *Empidonax virescens*; Trail's flycatcher, *Empidonax trailli;* least flycatcher, *Empidonax minimus*: red-winged blackbird, *Agelaius phoeniceus*; meadow lark, *Sturnella magna*: Bullock's oriole, *Icterus bullocki*; cardinal, *Cardinalis cardinalis*; rose-breasted grosbeak, *Zamelodia ludoviciana*: cliff-swallow, *Petrochelidon lunifrons*; white-eyed vireo, *Vireo griseus*; and American robin, *Planesticus migratorius*.

RADETZKY (A. F.). ЯЙЦЕБДЪ ПЛОДОЖОРКИ ОПИСАНІЕ, БІОЛОГІЯ И УТИЛИЗАЦІЯ ЕГО ВЪ ДѢЛѢ БОРЬБЫ СЪ ЯБЛОННОЙ ПЛОДОЖОРКОЙ [*Oophthora semblidis*, Aur. (*Pentarthron carpocapsae*, Ashm.); description, biology, and utilisation of it in the struggle with *Carpocapsa pomonella*, L.] Turkestan Entom. Sta., Tashkent, 1913, 28 pp., 1 pl.

The chief ally of man in the struggle against *Cydia* (*Carpocapsa*) *pomonella*, L.,* in many fruit districts of Russia appears to be a small hymenopterous parasite of the family of CHALCIDIDAE, *Trichogramma semblidis*, Auriv.† which destroys the eggs of *C. pomonella*, L., in enormous quantities.

This insect was discovered in Sweden by Aurivillius in 1897, as a parasite of the eggs of *Semblis lutaria*. It was found in Russia in 1903 by J. F. Schreiner in the Government of Astrachan, and by I. V. Vassiliev in the Kharkov Government in 1904.

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* Mr. J. Hartley Durrant informs us that neither *Carpocapsa* nor *Laspeyresia* can stand as generic names for the codling moth, which should be referred to *Cydia*.—ED.

† Under this name the author includes *T.* (*Pentarthron*) *carpocapsae*, Ashm.; but Mr. A. A. Girault, who has examined the types of this insect, has recently stated that it is distinct from *T.* (*Oophthora*) *semblidis*, Auriv.—ED.

In 1903 and 1904, in the gardens of the town of Astrachan, according to the observations of Schreiner, no less than 65–100 per cent. of the eggs of *C. pomonella* were infected by this parasite. This enormous percentage was confirmed by Vassiliev in 1906 and in 1910.

In the year 1911 the author imported the *Trichogramma* from Astrachan to the fruit district of Tashkent, where up to that time it was not known, and caused them to multiply in the laboratory in enormous quantities and then let them loose in the orchards. The insects readily became acclimatised and in 1912 in certain gardens in Tashkent destroyed up to 100 per cent. of the eggs of *C. pomonella*.

The parasite presents the valuable characteristic that it is able to develop at the expense of many different species of Lepidoptera and other insects. Among the injurious insects, it was obtained in European Russia from the eggs of *Dendrolimus pini*, L., *Malacosoma neustria*, L., *Euproctis chrysorrhoea*, L., *Lymantria monacha*, L., and *Stilpnotia salicis*, L. (I. V. Vassiliev). In Turkestan the author obtained it from the eggs of *Sarrothripus musculana*, Ersch, and *Cydia funebrana*, Tr. In Italy large quantities were obtained from the eggs of *Barathra* (*Mamestra*) *brassicae*, L. (Masi).

Thanks to these qualities, *T. semblidis*, after the extermination of the codling moth, will not be doomed to destruction, but will continue its existence at the expense of other insects.

The number of eggs laid by the female in the middle of summer amounts to over one hundred. In one egg of the codling moth it deposits from one to six eggs.

The complete development of the Chalcid from egg to imago lasts on an average 9 days, but depends on the temperature. The development of the eggs takes from one, to one and a half days, that of the larvae 5 days, and that of the chrysalis 3 days. In Tashkent in July the total development lasted not more than 7 days, but in the end of August up to 12 days.

The full-grown insect lives 11 days, but the laying of the eggs takes place only during the first days after hatching. From the middle of June to the middle of September the author succeeded in producing eight generations in Tashkent.

With regard to the hibernation of the parasite the author's observations led him to believe that any wintering egg can serve as a host for this purpose, and even eggs which under normal conditions would not winter. At the time of writing (beginning of October 1912), the parasite was wintering as a larva in the eggs of *Catocala elocata*, Esp., *Grammodes algira*, L., *Apopestes spectrum*, Esp., a Lasiocampid moth and some others. According to Vassiliev the larvae of the parasite hibernate also in the eggs of *Orgyia*. Under natural conditions the parasites cannot always find sufficient hosts in which to winter, so that only a small number of them survive. Notwithstanding its polyphagous instincts the parasite attacks chiefly the eggs of *C. pomonella* and in the presence of these eggs never touches any others.

Collinge (W. E.). **Seventh Annual Report of the Honorary Consulting Biologist.**—*Journ. Land Agents' Soc.*, Oct. 1913, pp. 1-24. (Reprint.)

In the course of a sketch of various pests, the author states that *Phratora vitellinae*, Kirby (the Willow Beetle), injurious to the growing points of young osiers, deposits its eggs in clusters on the underside of willow, poplar and sallow leaves, upon which the larvae feed as soon as they hatch out. When fed they fall to the ground and pupate, and the imago appears in autumn. They hibernate under bark, and in rotten wood and rubbish, which should be burnt in winter. Shaking the insects off the twigs into vessels containing paraffin, or on to insecticides poured on the ground, is more effective than spraying with Paris green, quassia, etc.

Aphis amygdali, Fons., attacked peaches and apricots in May, and *Rhopalosiphum dianthi*, Schrk., later in the summer. Both insects are called the "Peach Aphis." The former leaves the peach in summer and returns in autumn. Frequent spraying with quassia and soft soap is recommended, but fluids containing paraffin injure the leaves and fruit. For *Schizoneura lanigera*, Hausm. (the Woolly Aphis) the roots should be uncovered in winter and treated with almost boiling water, or two to three pounds of a mixture of equal parts of naphthalin and sand should be scattered over them and covered with soil. For the branches, 7 lb. linseed oil, 2½ lb. white lead and 1 lb. zinc oxide should be boiled together for 10 minutes, and mixed, when cold, with 1 lb. turpentine. This new remedy should be applied with a brush, in the autumn and at the end of June. The larvae of *Pulvinaria vitis* var. *ribesiae*, Sign. (the White Woolly Currant Scale) hatch out in June or July and run all over red and black currant plants. Three moults, followed by hibernation, take place on the previous year's wood, and growth recommences in March or April. The bushes should be sprayed with paraffin emulsion when the larvae hatch, and in January or early February with a mixture of 2 lb. 98 per cent. caustic soda, ½ lb. soft soap, 5 pts. paraffin and 1 gal. water.

Cheimatobia brumata, L. (the Winter Moth) has done little harm for several years. The eggs of *Porthesia auriflua*, F. (the Gold Tail Moth) are laid in August on apple, pear, plum, cherry, hawthorn, hazel and other trees. The larvae appear in seven to twelve days, spin cocoons and hibernate in crevices in the bark, under leaves, etc., come out when the buds begin to swell, and pupate about the end of June. The larvae may be caught in bands of hay ropes, old sacks, etc., and lead arsenate is a good spray.

The larvae of *Phyllobius oblongus*, L. (the Oblong Leaf Weevil) and *P. maculicorius*, Germ. (the Green Leaf Weevil) feed on roots during winter, pupate in April, and in May the imago attacks apple buds and blossoms. The trees should be jarred on dull days and the falling beetles collected, and the

ground should be watered with lead arsenate or other liquid soil insecticides.

Syphonophora pisi, Kalt. (the Pea Aphis) oviposits in October on clover and vetches, and in spring the larvae migrate to small pea plants. The insects are viviparous and produce from twelve to sixteen generations. The peas should be sown away from clover, and in rows. A shallow pan, five or six inches deep, and containing water and a film of kerosene, should be drawn between them and the aphides brushed into it, and spraying, with considerable force, of a mixture of 1 lb. whale-oil soap to 6 gals. water will dislodge the young from the terminals. Kerosene emulsion is to be avoided. When the air temperature is 95° that of the soil is high enough to roast the aphides if knocked off the plant and the soil raked over them. For *Aphis brassicae*, L. (the Cabbage Aphis), shepherd's purse (*Capsella bursa-pastoris*), wild mustard (*Sinapis arvensis*) and other cruciferous weeds, from which it migrates, should be destroyed and a mixture of $\frac{1}{4}$ lb. soft soap to 1 gal. water should be applied 3 or 4 times a week. Watering with weak solutions of liquid soil insecticide will dispose of *Pemphigus lactucarius*, Pass. (the Lettuce Root Aphis), which attacks wallflower, stock and other roots as well as those of lettuce.

The destruction of injured potato stems, and of burdock, mullein, thistles, foxglove and other plants on which the larvae feed, is the only remedy for *Gortyna ochracea*, Hübn. (the Frosted Orange Moth). The moths appear and oviposit in September, the larvae hatch out in April and feed till late July or early August, pupating inside the stem. Digging up the grassy "headlands" round cornfields is suggested in the case of *Apamea didyma*, Esp. (the Common Rustic Moth). Pupation takes place from the middle of April to the end of May, the imago appears about the end of June, the eggs are laid in autumn, and the larvae, hatched before winter, pass from grasses to young cereals; but the particulars are still doubtful.

Ground unslaked lime or naphthalin will destroy the larvae of *Bibio marci*, L. (St. Mark's Fly) and *B. johannis*, L., introduced into nursery soil with manure or leaf-mould. The former damages tomatos, young coniferous plants, seedling ash and young spruce; the latter larch seedlings and hop roots. *Hylemyia coarctata*, Fall. (the Wheat Bulb Fly) oviposits in June and July on couch and other wild grasses, which should be destroyed. The larvae pupate in September and the imago appears in October. Other larvae attack spring-sown wheat plants in April, and against these a dressing to hasten the growth of the plant is suggested, or, if too heavily attacked, rooting up and burning. From April to May *Oscinis frit*, L. (the Frit Fly) lays on the leaves of young plants. The imago appears again about the middle of July, laying on various grasses, and if sufficiently developed, in the ears of oats and barley; and a third brood comes forth in August and September, ovipositing on different wild grasses. The destruction of these, deep ploughing, or ploughing with a skim-coulter, early sowing, as far as possible from previously affected areas, and the dressing of barley and oats with fertilisers are recommended.

Cameron (A. E.). **On the life-history of *Lonchaea chorea*, Fabricius.**—*Trans. Entomol. Soc. Lond.*, 26th Sept. 1913, pp. 314-322, 1 pl., 1 fig.

Adults of this species were reared from larvae observed to be feeding on cow-dung. Transferred to wire-gauze breeding-cages pupation occurred in about 12 days, the adults appearing about 10 days later. The whole development from the egg to the imago occupied about 30 days at the outside. The egg of *L. chorea* is very similar in size and appearance to that of many of the Anthomyiidae, being easily recognisable amongst the cow-dung by reason of their pure white colour. The full-grown larva is 9mm. long, and is of the cylindrical form usual in Muscid larvae; the colour is dull white, and the cuticle smooth.

The larva is very tenacious of life. Plunged three times consecutively into a watch-glass containing absolute alcohol, which was each time allowed to evaporate, the larva faced the ordeal and came out alive. Keeping it in water for four hours, after this hardening process, likewise had no ill effect. An all-night sojourn in diluted beer also failed to damage it. After a short rest, it was submerged for a whole day in undiluted beer and then restored to a diet of decaying beetroot, when it shortly afterwards pupated and completed its metamorphosis.

As to its economic status, the larva is not known to cause much damage, although it may be extensively found at times attacking crops of diseased beetroot. The fly does not frequent human habitations; so that it could not be classed with the disease-carrying house-fly, which it resembles to a certain extent in its breeding habits. Rather should it be classed in that large group in which are included all "followers of decay," in that plants, such as beetroot and certain Monocotyledons, which have been previously attacked by fungus or other destructive agencies, are liable to have the injury accentuated by the larvae of this fly. The larvae may be transmitted by the use of infested dung for the manuring of soils in which the crops liable to attack are cultivated.

As to treatment, if the dung be mixed with a small quantity of some chemical fertiliser, such as commercial sulphate of ammonia, the larvae will be killed, and at the same time the percentage of available nitrogen will be increased by the admixture of the chemical. Other dressings may be used with equal effect, such as the potash salts, superphosphate of lime, etc.; but care has to be taken to use them in fertilising quantities, otherwise serious damage might be done to the plants.

Girault (A. A.). **Notes on the Chalcidoid Hymenoptera of the Family Trichogrammatidae, with description of a New Sub-genus from Australia.**—РУССКОЕ ЭНТОМОЛОГИЧЕСКОЕ ОБОЗРѢНІЕ (Revue Russe d'Entomologie). S. Petersburg, xiii, no. 2, 1913, pp. 292–294.

The author records the receipt of many specimens of both sexes of *Trichogramma minutum*, Riley, from Van Dine, in Porto Rico, reared from eggs of *Diatraea saccharalis*, F.; this is a new locality. Also of four specimens reared from eggs of *Cydia*

(*Carpocapsa*) *pomonella* from the Iowa Agricultural Experiment Station. The types of *Trichogramma* (*Pentarthron*) *carpocapsae* Ash., were sent by N. Kurdjumov from Poltava to the author, who pronounces them to be distinct from *T.* (*Oophthora*) *semblidis*, Auriv. The coloration of *Trichogramma* is very variable, but not to the extent of forming a different pattern, as in this species. A number of females of *Trichogramma fasciatum* (Perkins) were sent to the author by N. Kurdjumov as egg-parasites of the codling moth in Tashkent. This species is also known to be parasitic on *Diatraea saccharalis*, and is found in Russia, Mexico, and Turkestan, being probably synonymous with *T.* (*Encyrtus*) *embryophagus*, Hartig. Concerning 9 females of a species of *Trichogramma* bred from the eggs of *Mamestra brassicae* at Kiev, by V. P. Pospielov, the author is inclined to agree with Pospielov that the species is *T. semblidis*, but says that he could be more certain if he knew of the occurrence of wingless males, this being the only certain way of distinguishing *semblidis* from *minutum*.

Троїтzкy (N. N.). О ЯЙЦЕѢДЪ-ПАРАЗИТѢ ВИШНЕВАГО СЛОНИКА [On an egg-eating parasite of *Rhynchites auratus*, Scop.]. Reprinted from *Jl. Agriculture of Turkestan, Tashkent*, no. 5, 1913.

The author reports on a parasite of the eggs of *Rhynchites auratus*, Scop., which he discovered in the spring of this year in Tashkent, this being the first time that a parasite of this insect has been observed. The peculiar mode of oviposition by the insect, the well protected larva, the quick development of the imago from the pupa, all appeared to preclude the existence of parasites and limited the possibility of their being discovered. At the same time the multiplication of the insect was limited by some unknown causes, and its numbers fluctuated widely during different periods; in 1912 about 88 per cent. of the eggs did not develop further, although the examination of the attacked fruits showed no faults in the protective constructions round the eggs, and they were found lying normally in the holes where they were deposited by the females. Only the external appearance of the eggs was different. The white, slightly yellowish, soft pellicle of the eggs had become hard and brown, and remained in this state during the whole winter in the laboratory at St. Petersburg. When the author arrived at Tashkent in the spring of this year, he found in an orchard underneath the trees and also on the branches cherry stones of last year with similar eggs which had wintered on the stones.

A microscopic examination of these eggs revealed, not the embryos of *R. auratus*, but the larvae of some unknown parasite. A little later the author found a female imago in a glass, in which he had kept the old cherry-stones found by him on the 18th April. From some other cherry stones, collected on the 29th April all the parasites had emerged. Thus it was established that the insects remained in the eggs during the summer, winter and into the spring of next year, being protected from bad weather, etc., after

the fruits had dried by the hard pellicle acquired by the egg. The parasites issue from the egg in the spring, and infect the eggs laid by the female of *R. auratus* a few days, or perhaps even a few hours, after the oviposition. No male parasite was obtained, and only one female.

The author describes the parasite and points out that it is similar to the insects of the genus *Oophthora* (CHALCIDIDAE) as described by Aurivillius. He is of opinion that he has discovered a parasite of *R. auratus* which is specially fitted to the conditions under which the eggs of this insect are laid.

The importance of the parasite can be judged from the great number of eggs (88 per cent.) which it destroyed in 1912, and the author suggests that it should be specially propagated for the fighting of *R. auratus*. He recommends that the stones of damaged fruits should be kept in boxes left in the orchards The larvae of *R. auratus* issuing from the stones will perish, owing to the absence of suitable conditions for their pupation, while the parasite will emerge in the following spring.

TROÏTZKY (N. N.). КЪ БІОЛОГІИ ОЛЕНКИ ТУРАНСКОЙ [On the biology of *Tropinota turanica*, *Reitt.*]. Reprinted from the *Jl. Agriculture of Turkestan*, *Tashkent*, no. 6, 1913, 18 pp., 2 figs.

The Cetoniid beetle, *Tropinota turanica*, Reitt., is a prominent and regular pest of orchards in Tashkent. Its life-history has, according to the author, been but little investigated and the only reference to it that he was able to find was an article by Sokolov in the "Journal of Agriculture and Forestry" (Сельское Хозяйство и Лѣсоводство, 1894, no. 5). The bionomics of *Tropinota hirta*, Poda, found in great numbers in the southern parts of European Russia, where it is causing enormous damage in the Governments of Astrachan, Saratov, Charkov, etc., have been more fully described. According to Schreiner, the latter insect injures the blossoms of apricots, cherries, thorns, apples, pears, strawberries, etc., attacking only the unfertilised blossoms and eating away the ovaries, pistils, and stamens, but doing no great damage to the petals. The injury is done only by the perfect insect, the eggs being laid in the fields, where the larvæ feed on roots of various plants.

The author describes fully the construction of the mouth-parts of *T. turanica*, and gives a figure showing details, as well as another figure showing the insect attacking the blossoms of pears. From the construction of its mouth, he deduces that it would be impossible for the insect to cause injury by gnawing fruit, as its maxillæ are not capable of dealing with the hard skin. This deduction has been confirmed by further observations of which he gives a detailed statement. The insect appears in the orchards of Tashkent about the end of March, and observations show that it prefers pears to other fruit, and when these are present they attract more beetles than apple trees, even should the latter be in full bloom and the blossoms

of the former fading. The author has conducted experiments in the laboratory which confirmed the above distinction, and, besides, showed that on the blossoms of pears the insects chiefly injured the calices, whilst on apple blossoms the petals and leaves were chiefly attacked, and, in the case of black cherries, the ovaries and the stamens. A table summarising the results of the experiments is given. The author doubts the statement of Schreiner that *T. hirta* feeds only on unfertilised blossoms, and, according to his observations, this is not the case with *T. turanica*.

As preventive methods against *T. turanica*, some authors have suggested (1) poisoning by liquid sprays; (2) spraying with evil-smelling substances; (3) bee-keeping; (4) cultivation of tall-stemmed fruit trees; (5) covering the crown of the trees with cheese-cloth; (6) baits; (7) destruction of the larvæ; and (8) collection of the beetles by hand. All these methods are very ineffective and the best amongst them is the last-named. Schreiner has recommended methods aiming at the destruction of the insects by (1) construction of bait-heaps to attract the beetles to oviposit; (2) spraying with water; and (3) sticky traps of a blue colour. The last remedy consists of sheets of blue paper covered with some sticky material and laid about the orchards on the earth between the trees or suspended between them. There is some evidence that the insects visit these traps freely and can be destroyed later. Some growers have added various perfumed essences to the adhesive, such as oil of almonds; other evidence goes to show that the insects are attracted by a paste made from wine-worts. According to Schreiner, it is the blue colour which attracts the insects, but the author is not satisfied that that is the case, as the sight of most insects, and of Coleoptera especially, is very poor, and in searching for food they are directed rather by smell than by sight. The author cites also the evidence of one landowner who reports that the insects ignored his traps. The question, therefore, whether the insects are attracted by the blue colour, by perfume, or by wine-worts remains an open one.

According to Sokolov, *T. turanica* is found in Turkestan in great quantities during April and May, and single specimens are obtainable even in June. The author has not yet been able to observe this. The insects disappeared from the orchards at the end of April, when they were found on weeds. In the laboratory the insects began to die off on the 16th May. In the ovaries of the dead females mature eggs were found.

Троїтzky (N. N.). МАТЕРІАЛЫ ПО БІОЛОГІИ ВИШНЕВАГО СЛОНИКА [Materials for the biology of *Rhynchytes auratus*, Scop.]. Published by the Government Entomological Station of Turkestan. *Tashkent*, 1913, 49 pp., 2 pls.

The author gives a detailed description of this weevil, and points out the difference between it and the two related species, *R. bacchus*, L., and *R. giganteus*, Kryn. He further describes the larvæ and pupæ. In Russia the insect is found in the

southern and south-eastern parts of European Russia, in the Crimea and the Caucasus, and in the territories of Middle Asia. Lately it has been noticed also in the Government of Moscow, and the author found it on a wild cherry tree in the Aul of Nuchur, at Kopet-Dag, near the Persian frontier, at a height of about 4,000 feet, on 20th July 1912.

The insects appear in the orchards of Tashkent at the beginning of April. They winter in the imago stage, and the first few days after their exit from the earth the beetles keep on the lower parts of the stems of cherry trees, whence they gradually spread all over the crown of the tree, feeding on the blossoms and buds, and later on the fruits. They are very wary, and in case of suspected danger they drop to the earth, very seldom flying away.

The oviposition has already been described by Fabre, Sokolov, and Schreiner, and the author cites their descriptions, supplementing them by his own observations. According to them, the female gnaws a round hole in the pericarp, the bottom of which is formed by an excavation in the surface of the still soft stone, so that the stone is not actually penetrated. Having deposited the egg, the female, leaving a cylinder of pericarp round the hole, gnaws round this cylinder another channel, reaching to the stone, so that the cylinder is isolated from the surrounding tissue of the fruit; the hole in the cylinder is then filled by the female with fragments of the fruit through which air can reach the larvæ. As the cylinder is quite isolated by the circular channel, the ventilating hole in it cannot be overgrown with new tissue and thus stop the access of fresh air, which is necessary for the life of the larva. This is the mode of oviposition on cherries; on apples or pears this laborious method cannot save the larva from suffocating, and, according to Schreiner, about 98 per cent. of eggs of *R. auratus* laid on these latter fruits do not develop further than to the larval stage; for the parenchyma of the pericarp, which has been destroyed by the insect, produces a new corky tissue, which overgrows the egg and suffocates the larva. Other members of the same group such as *R. bacchus*, L., *R. cupreus*, L., and *R. aequatus*, L., which oviposit in apples, and *R. giganteus*, Kryn., which lays its eggs in pears, are, however, able to produce descendants, owing to the fact that they damage, at the time of oviposition, the pedicel of the fruit, so that it cannot grow any new tissue, but dries and drops from the tree.

In each fruit only one egg is deposited, each female laying about 150 eggs. The whole life of the beetles from their exit from the earth to their death is about 2¼ months (maximum life of one insect from 5th April to 26th June). The egg stage lasts about 10 days. The larva lives inside the stone, where it moults several times, and when mature passes into the earth for pupation. The larval stage lasts 20-30 days (?). The fruit grows and develops while the larva is inside the stone, and the insect may leave the fruit even while the latter is still on the tree. The maximum of oviposition takes place at the end of April and beginning of May; the exit from the fruits occurs in the early part of June. Having left the fruit the larvæ pass

into the earth, to a depth of 1-2 inches, to pupate. Before pupating they make a cocoon in the earth in which they remain for some time. Pupation begins early in August. On the 16th August there were found in one orchard in the earth 12 larvæ, 4 pupæ, and 5 imagos, all in cocoons. As to the hibernation of *R. auratus*, some authors maintain that they winter as pupæ and that the imago issues only in the following spring. Schreiner reports that in the Government of Saratov it winters in the larval stage; while Plotnikov states that it is the imago which hibernates. This is also the opinion of the author, who considers that the hibernation of the larva or pupa would be exceptional.

Schreiner reports that he has observed in the Governments on the Volga that *R. auratus* were feeding on plums, apricots, apples, pears, prunes, thorns and even on gooseberries. It was impossible for the author to make observations in the open, and the few beetles observed fed only on cherries. But experiments conducted indoors showed that (1) on pears the insects feed on the leaves and pedicels mostly, and only slightly on the fruits; (2) on peaches they also feed only on the leaves and only one egg was laid, but no channel is made round it; (3) on apples they feed on the fruits, eating the parenchyma of the pericarp and oviposit quite freely, 74 eggs having been laid, but no larvæ developed. The author points out the conflicting nature of these results. The insects refused to lay eggs on peaches (stone fruits) and oviposited freely on apples (seed fruits). Correct explanations can only be obtained by further observations in nature.

In Tashkent the greatest amount of injury done to cherries is by the imago. The larvæ, although feeding on the kernels, do not touch the fruit. The injuries done by the imago are twofold, those due to feeding and those accompanying oviposition. The first group of injuries affect the leaves, buds and flowers in the spring, whilst the latter affect the fruit. Although the author has no evidence of the amount of damage done by the insects to the leaves, &c., there can be no doubt that these injuries make the tree weak and affect its utility. The injuries done to the fruit are theoretically not very serious, as these are able to recover and can develop while the egg and larva are inside, but the market value of the crop is appreciably lowered. The author reports that in one orchard about 50 per cent. of the fruits were affected on the 29th April, whereas on the 13th June there were 58 per cent. of fruits with larvae in them, 30 per cent. from which larvæ had emerged, and only 12 per cent. were untouched. Approximately the same figures were obtained in other orchards. The following remedies have been suggested:—(1) spraying the trees with milk of lime, which it is recommended to apply early in the spring, before the exit of the beetles from the earth; (2) collection of the insects on the stems of the trees on which they pass the first few days after exit from the earth; (3) spraying with Schweinfurt green (2·7 galls. of water, about 0·5 oz. of green, about 1 oz. of lime in lumps, about $\frac{1}{4}$-lb. of rye meal) when the insect starts feeding; the first spraying with the insecticide must be done before the

blossoming of the fruits and then repeated 10-12 days later before oviposition has started; (4) during the same period it is also recommended to shake the insects from the trees; the insects are easily frightened and when they drop to the earth they can be collected and destroyed, but this method cannot be applied during hot weather, as they may then fly away instead of dropping; (5) the fruits infected by the insects ought to be picked and destroyed; (6) Sokolov recommends also digging up and ramming the soil at the period when the larvæ have passed into the earth; in this way a great number of pupæ will be exposed and be eaten by birds or destroyed by the weather; the majority of the pupæ left in the earth will also perish, as their natural position will be affected, so as to make their further development impossible.

Finally, the author suggests destroying the insects when all of them are in the earth, in the period from August to the following March, by poisoning them with the vapours of carbon bisulphide (CS_2). Usually when this insecticide is applied an injector is used to force the vapours into the earth, but, as the wintering stages of *R. auratus* are generally found very near to the surface an injector would be unsuitable. Instead of this, the author recommends the method proposed by A. A. Silvantjev as follows:—Round the stem of a tree, underneath which the insects winter, a cone-shaped tent is affixed. The upper part of the tent is bound round the tree, the lower part is spread out and the edge buried a few inches in the earth. The insecticide is placed in a vessel and put inside, it being better to put the vessel rather high up so that the vapours should be more equally distributed. Instead of a tent, when this is not convenient, sheet-iron boxes open at the bottom (galvanised iron is preferable) made in two or more sections to fit round the trunk of the tree can be used. These boxes can be put over a vessel containing carbon bisulphide, or the latter can be poured in by means of a funnel fitted with a cork and forming part of the box. The outer edges of the boxes should be driven into the earth. The amount of insecticide to be used, as well as the duration of saturation of the earth by it, must be settled by experiment. The author figures a sectional drawing of a tent and of a box in position.

Serbinov (I. L.). КЪ ЭТІОЛОГІИ ГНІЛЬЦА У ПЧЕЛЪ [On the etiology of foul brood in bees].—СЕЛЬСКОЕ ХОЗЯЙСТВО И ЛѢСОВОДСТВО журналъ Глав. Управ. з. и з. ccxlii, pp. 367–382. *St. Petersburg*, July, 1913.

The author begins by pointing out the great importance of the question of the origin and spread of foul brood in hives, both from the scientific and practical points of view. He refers to his work, "The Foul Brood of Bees and the fight against it" (St. Petersburg, 1910), in which he has indexed the whole literature of

this subject, and to the work of F. Cheshire and W. W. Cheyne (*Journal of the Royal Microscopical Society*, 1885, Series II), and describes and compares the results of his own experiments during the last two years, and specially during the spring and summer of 1912, with the views of previous authors.

According to Schoenfeld the sources of infection are the honey-bearing plants, and the author, while not disputing this theory remarks that it has not been proved experimentally, and besides it does not provide an answer to the question: What is the origin of the microbes on those plants? According to Bespalov, who doubts whether the honey-bearing plants play any part at all, the original infection spreads through the air, owing to the fact that the minute spores of foul brood thrown out from the hives are dispersed and carried by the wind to the honey or pollen, thus infecting the larvae through their food. The author, admitting the possibility of this mode of infection, again observes that neither has this theory been proved nor does it supply an answer to the above question. In his opinion the problem was solved by him in 1911, when he obtained a new organism, *Bacillus butlerovii*, provoking foul brood not only from the diseased brood, but also from dirty water in the neighbourhood of the apiaries at the Viritza station. It was remarkable that only the hives situated near the ditches filled with dirty water were infected. He repeated these investigations in his experimental apiary near Oranienbaum, which is situated near a small dirty pond from which the bees take their water, especially in the spring and at the beginning of summer, and when the bees developed the " European foul brood " he was able to produce the *Bacillus alvei* from the brood, as well as from the water of the pond. Thus the author has isolated two provokers of foul brood from dirty stagnant water, and he concludes that all forms of foul brood provoked by bacteria have their origin in the water taken by the bees from similar places. Bespalov agrees with the author and allows that most frequently the infection is produced in the way indicated, which is also confirmed by the statement of E. F. Fillips, to the effect that the " European foul brood " is more dangerous during the spring and the beginning of the summer, whereas it disappears at the end of the summer and in autumn. Another bee master, K. I. Shishev, reports that in the Crimea foul brood, which was playing havoc in the apiaries during the first half of the summer, disappeared in the second half, although an increase in the brood was noticed everywhere at that time. From the statements of the two last-named observers Bespalov concludes that, although it is not yet quite proved, the disappearance of the disease in the second half of the summer can be explained by the drying out of various pools of standing foul water which served previously as drink for the bees and helped to spread the disease.

The author reports observations of his own tending to confirm his view. He noticed in the spring that the bees fly first to gather pollen and then to the dirty water places, and specially to pools into which dung heaps drain; at this time there is in the hives a fair quantity of brood and nurse bees, and the young bees require

nitrogenous matters, warm water and mineral salts for their growth, all of which are absent from the hives in the spring. The pollen provides the nitrogenous matters, the dirty water supplies the mineral salts and the warmth, which it is necessary for the nurses to have to prepare the milk. Dirty water is warmer than clean, being more readily heated by the sun, and also because the putrefying processes going on in it increase its temperature. The author has experimented in this direction by putting both warm and cold water in the apiaries in the spring, when the bees took the warm water and did not visit the dirty water pools. When visiting the latter they take up the disease germs, and thus it is not the air but water which is the primary source of infection by bacterial diseases. With regard to diseases provoked by fungi such as mycosis of which the fungus *Aspergillus pollinis*, described previously by Howard, is the cause, the infection is air-borne, as these fungi are surface organisms. The spores of this fungus are always found on old wax in damp places, where, in the presence of sufficient moisture, they grow and produce new spores, which pass through the air into the cells to the pollen and honey, and from one hive into another. Actinomycosis of bees is provoked by *Actinomyces* which are found everywhere in nature: in water, in the air and in the earth, so that the infection by them may take place in various ways.

The author further deals with the actual mode of infection of the larvae. He quotes Cheshire, according to whom larvae are infected through the antennae of the nurse bees, which the author is prepared to admit, providing the primary infection (of the bees) takes place through the air; in this case Cheshire is, according to the author, even too cautious, for if the spores of the bacteria of foul brood are in the air, every bee coming into the hive and passing over a cell may be a carrier of infection, and the cells and the wax generally may be infected even before oviposition.

According to Harrison, the spores of the disease cannot be found in the air, as the sticky and even quite dry masses of dead larvae keep them fixed *in situ*. In the opinion of the author the mode of infection of the larvae is much simpler, and, assuming that primary infection proceeds through water, it spreads in the hive through the digestive organs of the nurse bees. He quotes M. Kustenmacher (Central. f. Bakt. Parasitenkunde und Infektionskr., 1900, xxiv, pt. 2), according to whom the water gathered by the bees is used in the hive exclusively to swell the pollen from which the nurses prepare the milk. The pollen is consumed by the nurses in great quantities, but owing to its having a hard skin they require water, and warm water, to make the pollen swell in their digestive tract. In the milk stomach of the nurses the pollen loses its skin, and there remain the so-called spermatoplasms—*i.e.*, the contents of the pollen grains, consisting of albumen, sugar and oil. This mass forming the milk is partly consumed by the nurse bee and partly given as food to the larvae. In this way, if the water brought by the bees contain the microbes of foul brood, the latter will pass

into the digestive tract of the larvae and cause infection. The author describes the following experiment conducted by him on the infection of bees by *Bac. butlerovii*. He charged two double-framed observatory hives (Dadan's pattern) with frames with broods and bees from a healthy hive. Although there was sufficient pollen and honey, some fresh good honey, previously boiled for 2½ hours, was poured into the hives occasionally. These hives were isolated from the apiary, there were no queens, but the bees were quite happy and fed the brood on the food in stock. In order not to allow the hives to cool down they were covered at night with blankets. Very soon part of the bees started to fly out, and the author then introduced, instead of the fresh honey, some water containing a 24 hours' bouillon cultivation of *B. butlerovii*, to which was added some sterilised honey. After two days the author examined the milk, and on 16 samples (agar-agar à la Maasen) he found the above bacteria, and in 6 days' time the larvae were attacked by " Butlerov foul brood " (this disease is described by the author in his article, " A new epizootic of bees in North European Russia," in Вѣстникъ Русскаго Общества Пчеловодовъ, no. 3, 1912). Examination of the digestive tract of the larvae proved the presence of great numbers of *B. butlerovii*.

Referring to the important question of the mode of the further and rapid spread of disease through the hives, the author attributes it to the honey, pollen, wax, frames and other appliances of beekeeping, to the movements of the bee-master, who may carry it through the whole apiary, and to the habits of the bees themselves. They usually clean out the cells of the diseased larvae, throwing out the dead bodies of the latter, and carry the disease through the hive, owing to small particles of diseased brood sticking to different parts of their bodies. The author has experimented on this subject by cutting away part of a frame with healthy brood and inserting a piece with cells of brood attacked by *B. alvei*, *B. butlerovii* and *B. brandenburgiensis;* after a few hours the bees began to clear out the diseased piece and through this infected the healthy brood, sometimes even on another frame, while the larvae in the immediate neighbourhood of the diseased piece remained healthy and grew quite normally. The air currents in the hive arising from the mass of working bees and from the ventilation also tend to carry the disease. An important part is in this respect played also by the nurse bees and by the queen.

The author quotes a statement by a practical beemaster, V. Kolodzeitchik, who noticed in 1911 that the nurse bees, while throwing out the diseased or dead larvae, always sucked out the milk from their internals; afterwards, when feeding the remaining brood, they undoubtedly infected them with the same disease. Bespalov has observed that on cold spring days the nurses devoured the brood infected by the disease, and thus were themselves infected and passed it over to the other larvae. The author further put frames with brood infected with *B. brandenburgiensis* into a large hive and noticed after a few hours that the bees were trying

to eject the foul brood. In a week the whole hive was attacked by "American foul brood"; he observed that the nurses sucked out the milk from the internals of the dead larvae. He continued this experiment through the whole summer, adding to the hive some healthy brood from the neighbouring hives and also some "flying bees," and he always noticed the same sucking of the larvae by the bees. The flying bees of the diseased hive were very dull and weak, and in their digestive organs were found *B. brandenburgiensis* and *B. alvei*. The author repeated this experiment in another hive with *B. butlerovii* and obtained the same results. Besides this he also made some experiments in Dadan's observatory hives with one frame, in which he put frames with a healthy brood and no flying bees sitting on them, and sprayed part of the brood in one hive with 5 cc. of a cultivation of *B. brandenburgiensis*, and in another hive with the same amount of a cultivation of *B. butlerovii*; his observations on these hives proved once more that the bees devour milk and suck the dead larvae before ejecting them. He found afterwards these bacteria in the digestive organs of the bees, but found no spores. He mentions that in the case of some bees in one of the hives he obtained from their digestive organs *Saccharomyces glutinis*, which microbe has no doubt pathogenic qualities, and he is of opinion that its influence upon bees ought to be studied.

He mentions that a whole set of experiments have proved that *B. brandenburgiensis* produces the typical form of foul brood on sealed, as well as on unsealed brood, which is also confirmed by some other authors (Kololev, Bespalov).

The author has also noticed that the nurses always lick the diarrhœtic excrements of the flying bees in the spring, on which excrements he found in one diseased hive many spores and rods of *B. alvei*. He further reports the following results of his observations on the part played by the queen in spreading the disease: (1) The nurse bees feed the larvae of the queens and thus infect them; (2) he found in the digestive organs of the queens of diseased hives, in their ovaries and eggs, both *B. alvei* and *B. butlerovii*, which confirms the statements of Harrison and of Mackenzie; (3) on the bodies of the queens which died in the observatory hives from the above two microbes he always found both of the latter, and he has been able to produce a cultivation of these microbes; this proves that the queen can pass the microbes to the larvae and can carry them about on the tiny hairs of her body; (4) he has noticed several times that the bees lick the excrements of the queen, thus becoming infected by the bacteria and carrying the infection further.

It is still not known what the activities and influence of the bacteria in the digestive organs of the larvae are, but the author points out that the whole aspect of feeding and digestion of the bees still requires to be studied. To provide some remedies against foul brood it is necessary to study more closely the morphology of the digestive organs of the bees and the physiology of digestion. At the moment he can only recommend the prevention of infection

by removing all pools of dirty water near the apiaries, supplying the latter instead with fresh, warm water, put about the apiaries in proper vessels. These remedies have proved effective in the author's apiaries against the importation of injurious microbes.

Vassiliev (I. V.). ВРЕДНАЯ ЧЕРЕПАШКА И НОВЫЕ МЕТОДЫ БОРЬБЫ СЪ НЕЙ [*Eurygaster integriceps*, Put., and new methods of fighting it by the aid of parasites].—БЮРО ПО ЭНТОМОЛОГІИ Ученаго Комитета Глав. Управ. З. и З., iv, no. 11, 3rd enlarged edition. *St. Petersburg*, 1913, 81 pp., 31 figs.

Amongst the pests of crops in Russia, *Eurygaster integriceps*, Puton, deserves special attention, as during the last two or three decades it has caused immense devastation in Transcaucasia and in Transcaspia (in the provinces of Samarkand, Fergan, Syr-Daria, Khiva and Bokhara) and is known also in Caucasia; in European Russia it is found in some south-eastern Governments: Charkov, Saratov, Stavropol, Ekaterinoslav, to some extent in Voronezh and also in the Don-Province. Besides Russia, it is found also in Greece, Italy, Algeria, Persia and Asia Minor.

In Transcaspia *E. integriceps*, called by the native Turkomen "jasmuck," is the most serious pest of crops, next to the Morocco locust. In the years 1901 and 1902 it destroyed in some parts of the Territory the whole harvest of wheat. There are two breeding foci of the insect in Transcaspia; the first, the Askabad-Durun focus, is the larger of the two and runs along the Central-Asian railway line from the Aul Berum to Askabad: the second, the Ateck focus, is situated in the district of Tedjen. The natural conditions of these areas are very similar; both lie in the narrow strip of oases along the mountain chain of Kopet-Dag, being enclosed between the latter on the south-west and the sandy desert of Kari-Kumi to the north-east. The above strip is a woodless elevated steppe, only scantily irrigated by a few rivulets and "aricks." The insect is entirely absent in the other mountainous parts of the country.

In Transcaspia *E. integriceps* mostly injures winter wheat, the cultivation of which predominates in that country, while barley is damaged by it only to a very small degree; for owing to their early ripening, barley crops are cut in the first half of May. It feeds also on grasses and only occasionally on other plants. The insect appears in the fields in the first half of April; hiding during the colder weather underneath lumps of earth, it gradually becomes more active as the days grow warmer, and then keeps to the tops of the ears. The first pair of copulating insects was noticed by the author (in 1908) on the 7th April; on the 12th the first heaps of freshly laid eggs were found and oviposition was proceeding quite freely on the 17th and 18th April. As a rule, the eggs are deposited on the leaves of wheat, barley and grasses: only exceptionally were they found on the

stalks or ears of these and other plants. They are placed in regular lines on the upper and lower parts of the leaves, usually to the number of 14. The first groups of newly emerged insects were noticed by the author (in 1903) on the 1st May, while in the laboratory emergence took place earlier. Oviposition and hatching proceeded for a whole month, the duration of the egg stage in captivity being 10 days; at the beginning of May great numbers of insects in their first and second stages were found in the fields; the total number of moults is 5, the last stage appearing in the middle of May. By the end of May the fields are swarming with the adult insects. In the first half of June, when the time of wheat harvest arrives in Transcaspia, the insect gradually disappears from the fields, moving on to its wintering places. The author found the insects hibernating chiefly in the plantations around the "aricks" and in the orchards and gardens of the natives, where they select the more elevated, dry spots, not flooded by irrigation, hiding under fallen leaves, mostly near the trunks of trees. In Caucasia however, in the district of Achalkalak, in Tiflis, the conditions are quite different, and the insects winter there on the stubble in the same fields which they have devastated.

In European Russia the insect appeared in great masses in 1901-03 and again in 1909-11, in the south-eastern part of the Government of Charkov and in the neighbouring districts of the Government of Ekaterinoslav and the Province of the Don. The author's investigations have been conducted chiefly in the district of Kupjan, in Charkov. *E. integriceps* was always accompanied by *E. maurus* and *E. hottentotus*, the proportions of the three species being, in 1903:—*E. integriceps*, 88 per cent.; *E. maurus*, 10 per cent.; and *E. hottentotus*, 2 per cent.; while in 1912 the figures were, 74 per cent., 22 per cent. and 4 per cent. Owing to the cold weather in the spring of 1912, when the temperature at the beginning of May fell as low as 3° R. (39° F.), the spring migration of the insects was delayed. The first specimens in the fields near the woods were noticed on the 17th May. In 1912 the first oviposition in Charkov was registered on the 23rd May and the last one on the 23rd July. The hatching out of the first larvae takes place about the beginning of June, while the adults appear in the first half of July; so that the whole life-cycle occupies some 40 days. The migration of the insects to their wintering places begins with the harvest of rye and barley, those being the earliest ripening crops. In 1903, the author found specimens of the insects on *Onopordon*, *Carduus*, *Euphorbium*, millet, flax, sunflower and other plants unusual for them. The author has thoroughly examined some deciduous forests in the Government situated near fields injured by the insects and found that the latter were evenly distributed over the whole surface of the forests. The principal masses of the insects lay directly underneath the litter formed by the fallen leaves, etc., sometimes in the upper stratum of the soil and only partly among the leaves themselves. The smallest numbers of insects were found in spots where (1) there was no litter, this being superseded by grass, in glades or open places in the forests;

(2) the underwood was too thick; and (3) the litter was too wet. In 1912 the author found that in the cases of forests situated in valleys the hibernating insects do not evenly cover the whole wood, but concentrate near the margins and are totally absent in the deeper parts of the wood. This has a practical importance, as the insects may be combated by raking the fallen leaves over them in heaps and covering the latter with earth. His experiments have shown that even a stratum of less than two inches proves impassable for the insects, which die, without being able to get out, in less than a month's time. Pine woods are less favourable as wintering places for the insects than woods of deciduous trees, as in the former the fallen needles are blown away by the wind and remain only in such spots where the pines stand close together or in the lower-lying parts of the woods. In the spring the young crops are sucked by the insects near the ground, very seldom in the middle of the stalk or higher; the results of the injuries are similar to those produced by *Oscinis frit*. Later on, at the time of the blossoming, there appears another form of injury called by the author "white ear"; in outward appearance the damaged crops resemble those attacked by *Cephus pygmaeus* or by *Ochsenheimeria taurella*. Still later, the adults and remaining larvae suck the grain in the ears. Figures illustrating all the above-described forms of injuries are given.

Two Tachinid flies have been observed to parasitise this bug, *Phasia crassipennis*, F., and *Anantha lateralis*, Mg. The former fly is a polyphagous parasite, attacking various Rhynchota besides the species of *Eurygaster*, such as, *Carpocoris nigricornis*, *Mormidea baccarum* and *Aelia furcola;* while Dufour reports having obtained it from *Pentatoma grisea*. In 1903 the author observed the first specimens of *P. crassipennis* in Charkov in the second half of May; the first generation was on the wing for about three weeks, till the middle of June. The eggs (estimated at about 30) are laid on the back of the victim at the moment when the latter is alighting or starting to fly, *i.e.*, when the back of the insect is not protected by the wings. Usually one egg is laid, but sometimes more are found on one host. The parasitic larva gnaws its way into the abdominal cavity, where it remains during the whole of the larval stage. When fully developed, the larva issues from the host, which is sometimes still alive at the time, and passes into the earth to pupate. The whole development of the parasite occupies about 6 weeks, the pupal stage lasting 11-12 days. The second generation of flies appears in the first half of July. Only the first generation is able to infect *E. integriceps*. The second generation parasitises chiefly other insects, as the *Eurygaster* have then mostly migrated to their wintering places.

The author has observed the second species of these parasites, *Anantha lateralis*, Mg., in Transcaspia, although it is also known in South Russia and Western Europe. The first adult brood appears in Transcaspia at the beginning of April, and the second in the middle of May. The *Anantha* parasitises not only the adult *Eurygaster*, but also the larvae in their last two stages.

The author found from 69 to 93 eggs in the ovaries of females of the parasite. The eggs, larvae in their last two stages, and puparia are described; the pupa stage is passed in the earth and lasts 7-8 days.

There are five known species of parasites of the genus *Telenomus* (fam. PROCTOTRUPIDAE) infecting the eggs of *E. integriceps* and of *E. maurus*:—*Telenomus semistriatus*, Nees, *T. simoni*, Mayr, *T. sokolovi*, Mayr, *T. vassilievi*, Mayr, and *T. rufiventris*, Mayr. The author disputes the statement of Peneau ("Le genre *Eurygaster*," p. 162) that *T. saakovi* is also a parasite of *E. integriceps*; he has bred it from the eggs of *Apodiphus integriceps*. He describes *T. vassilivei*, which was found by him in 1903 in Transcaspia, where it destroyed during that year 84 per cent. of the eggs of *E. integriceps*, while *T. rufiventris* was found by him in 1904 in the district of Rostov, in the Province of the Don, together with *T. semistriatus*. Usually one egg only is deposited in each egg of the host. Each female is able to lay up to 50 eggs, the oviposition being extended over 5-6 and more days (in the laboratory). The author's experiments have proved that in the absence of eggs of the three species of *Eurygaster* the parasites *T. vassilivei*, *sokolovi* and *rufiventris* freely infect the eggs of *Aelia furcula*, *Mormidea baccarum*, *Graphosoma lineatum*, *Carpocoris nigricornis* and *C. fuscispinus*, while they do not oviposit in the eggs of *Strachia oleracea*, *S. ornata*, *Pyrrhocoris apterus*, *Lygaeus equestris* and *Syromastes marginatus*; they also refused to oviposit in eggs of *Malacosoma neustria*, *Lymantria dispar* and *Euproctis chrysorrhoea*; the difference being due in the first instance to the form and size of the eggs and in the second instance to the character of their shells. The development of the parasites depends on the temperature, the average time for *T. vassilievi* being 12-13 days. The author obtained 7 generations of *T. vassilievi* during four months (April-August), and in his opinion *T. sokolovi* produces in nature more than four generations during one summer. Its eggs are found from the middle of May to the second half of August on various insect hosts. The females live only a short time after they have completed oviposition; but if this is prevented they may live as long as 14 months. The proportion of females to males is 5 : 1, and only a few females hibernate, most probably in the stubble of the fields.

The author further describes a Chalcidid hyper-parasite, *Encyrtus telenomicida*, Vass., which he has obtained from the eggs of *E. integriceps* infected by *T. sokolovi*, and gives an account of its life-history. They infect not only eggs of *Eurygaster*, but also those of other insect hosts, containing the larvae of *Telenomus*.

The last chapter is devoted to the methods of fighting the pest by means of its parasites, and the author points out that only the parasites of the eggs have a practical importance in this respect. The value of the parasitic flies is much less, for various reasons. They infect the pests after they have already done a great deal of harm; notwithstanding the infection the bugs

are sometimes able to oviposit and to continue their injurious activity; and finally, the difficulties of oviposition very often prevent effective parasitism.

The author further describes his experiment in transporting parasites, *Telenomus vassilievi*, from Central Asia to the Government of Charkov. He collected in April 1903 about 84,000 eggs of *E. integriceps* in Transcaspia, out of which number at least 34,000 (40 per cent.) were estimated to have been infected by *T. vassilievi*. He was not able to delay the development of the parasites in the eggs and had to transport them in the adult stage, keeping them in glass tubes (250-300 specimens in each) containing crumpled paper and with linen covers. He fed them on the voyage by moistening the linen with a solution of sugar in water. In this way he was able to bring about 12,000 specimens alive to Charkov (district of Kupjan) where they were released in two lots in the middle of June. His observations conducted on the spot during that summer proved that *T. vassilievi* had infected about 57 per cent. of the eggs of *E. integriceps* and *E. maurus*; that the parasite produced at least 4 generations during that summer and spread over a space of at least 73 acres, and that the fields in that locality have not suffered from the pest, though considerable damage was done on some neighbouring fields. The activity of the imported species was greater than that of the local one, *T. sokolovi*, which infected about 43 per cent. of eggs. [The accuracy of this estimate is questioned by some authors; see Dobrovolski below.] By this experiment the author also claims to have proved that it is possible to transport the parasites of the genus *Telenomus* over great distances (the distance in this instance was over 2,000 miles) and that when fed with a solution of sugar the parasites, especially the females which have no opportunity to oviposit, can live a long time (more than a year) without any other attention.

Dobrovolski (N. A.). НѢКОТОРЫЯ ДАННЫЯ О ПАРАЗИТАХЪ ЯЩЪ ВРЕДНОЙ ЧЕРЕПАШКИ ВЪ ХАРЬКОВСКОЙ ГУБ. [Some information on the parasites of the eggs of *Eurygaster integriceps*, Put., in the Government of Charkov]. —"ЭНТОМОЛОГИЧЕСКІЙ ВѢСТНИКЪ" [*Messager Entomologique*], *Kiev*, i, no. 2, 1913, pp. 229–236.

The author starts with a short reference to the injurious activity of *E. integriceps* during the last few decades and its periodical disappearance, explained, although not wholly, by the destructive influence of its parasites, of which he mentions *Telenomus* (*Prophanurus*) *sokolovi*, Mayr, *T.* (*Aphanurus*) *vassilievi*, Mayr, *T.* (*Aphanurus*) *semistriatus*, Nees, and *Trissolcus simoni*, Mayr, and the Tachinid fly (*Phasia crassipennis*). He has also found an undetermined fungus disease which causes the death of the pest. He refers to the work of Vassiliev, and especially to the experiment of transporting parasites from Middle Asia, and corrects some of his estimates; the number of eggs infected by *Telenomus vassilievi* is not 57 per cent., as stated by Vassiliev,

but only 38 per cent., while *T. sokolovi* has been responsible for the destruction of only 28 per cent. of eggs and not 43 per cent.*

As to the future of the parasites imported by Vassiliev in 1903, the author's investigations in 1912 failed to reveal the presence of this species, and although he is not able to say definitely that it has disappeared, he is of opinion that its influence is nil.

Having referred to some observations made by him last year, the author reports having found some species of parasites new to the Government of Charkov—*T.* (*Aphanurus*) sp. n., and *T. semistriatus*, Nees: he also found *T. sokolovi*, Mayr, the presence of which has been known before. *T. semistriatus* and *T. sokolovi* were the most important, while the new species has been but slightly active. The proportion of infected eggs varied from 88 per cent. to 96 per cent.; *T. semistriatus* infected from 37·5 per cent. to 68 per cent., *T. sokolovi* from 26·7 per cent. to 50 per cent., and the new species from 1·3 per cent. to 8·8 per cent. The time of development of *T. semistriatus* in the laboratory was about 20 days.

E. integriceps oviposited last year up to the beginning of July. The normal number of 14 eggs in a cluster was seldom found; the numbers usually ranged from 9 to 11, and sometimes even less.

Molinas (E.). **Cochylis et Eudemis.** [*Clysia* and *Polychrosis.*]—*La Vie Agricole et Rurale, Paris,* ii, no. 34, 26th July 1913, pp. 206-209.

This is a brief article dealing with the occurrence, anatomy, and life histories of *Clysia ambiguella* and *Polychrosis botrana.* The more common remedies are given, viz., light traps and alcohol baits for the moth, and spraying with arsenate of lead against the caterpillar.

Truffaut (G.). **Nos ennemis les pucerons.** [Our enemies, the Aphidae.]—*Jardinage, Versailles,* iii, no. 18, May 1913, pp. 459-462, 5 figs.

This is a short account of aphids attacking chrysanthemums, rose-trees, wheat, salads, etc. The anatomy and physiology are briefly given, and some of the most efficient remedies.

Chase (W. W.). **Principal Insects and Diseases of the Apple in Georgia.**—*Georgia State Board of Entomology, Atlanta, Bulletin* 38, May 1913, 58 pp., 10 pls.

The bulletin takes the form of a summary. Seven important insect pests of the apple in Georgia are described, viz., the Codling Moth (*Cydia pomonella*, L.), Plum Curculio (*Conotrachelus nenuphar*, Hbst.), San José scale (*Aspidiotus perniciosus*, Comst.), the Apple Aphids (*Schizoneura lanigera*, Hausm., and *Aphis pomi*, de G.) and the Apple Tree Borers (*Saperda candida*, F.,

* There appears to have been an error in the method of calculating the percentages.—Ed.

and *Chrysobothris femorata*, F.). In each case the life-history, the adult, the egg and the larva is described, and the appropriate treatment given. Stress is laid upon the value of high pressure spraying of the blossom, by which means the liquid may not only impinge upon the corolla and calyx, but penetrate to their base, where the insect lies hidden; the insect is thus destroyed before it has penetrated into the fruit. The best results have been obtained with the use of a nozzle throwing a heavy coarse spray, at a pressure of 200-300 pounds. In the case of the Codling Moth, the liquid recommended is lead arsenate 2 lb., lime 3 lb., water 50 gals. A second spraying should follow quickly upon the first, and a third six weeks after the first. The first only is to be applied with the coarse nozzle. In the case of the Plum Curculio, lead arsenate is recommended as a spraying liquid—2 lb. to 50 gals. of water. High pressure spraying is desirable, and should be performed just after the blooms are off. As exterminators of San José scale, the standard solutions of lime and sulphur have proved unequalled. Soluble oil preparations and kerosene emulsion (of the former, notably Scalecide) have done excellent work. The manufacturers of commercial lime-sulphur generally recommend it to be diluted in the ratio of one part lime-sulphur to ten parts water. The more thorough the application the better the results, and one infested limb or twig left unsprayed by a careless sprayer may re-infest the tree. High pressure spraying should be maintained.

Against the Apple Aphid nothing has proved more valuable than dipping. The author completely rid a one year old apple orchard of a heavy infestation by this method, which is simple, rapid and more thorough than any spraying method could be. Good results have been obtained by the use of kerosene emulsion, whale-oil soap, tobacco decoctions, etc., and a manufactured product called "Black Leaf 40," a concentrated solution of nicotin sulphate. The latter when used as a dip has an efficiency of 100 per cent. as an aphis destroyer, and, in addition, has a stimulating effect on leaf growth.

The Apple-tree Borers are readily removed with a knife or killed by prodding into their channels with a sharp wire. The safest, surest method is to tap the channels and inject into them small quantities of carbon bisulphide, stopping up all entrances to the channel with wax to retain the gas. The fumes, which are deadly to the larva, penetrate into all parts of the tunnels and kill the larvae within; care must be taken not to bring the carbon bisulphide near a flame, as it is highly explosive.

Houser (J. S.). **Grasshoppers.**—*Ohio Agric. Expt. Station, Wooster, Ohio,* Circular no. 137, 9th June 1913, pp. 127-134, 10 figs.

The author says that grasshoppers sometimes become very abundant over a limited area in Ohio, and though the attacks never reach the proportions of those in the central and western States, they are nevertheless sufficiently serious to demand prompt measures of control. Several such outbreaks occurred within the

State last season, the principal ones being at Upper Sandusky, Berea and Athens. At the former place a crop of 14 acres of clover had been cut prematurely, in order to prevent its being a total loss, and at the time of the author's arrival the insects were turning their attention to oats, rye and corn crops on the neighbouring fields. Nevertheless countless numbers still remained in the clover stubble, subsisting upon whatever vegetation was remaining, the common broad-leaved plantain being the favourite food-plant. Chickens and turkeys were fed on the land, and although their numbers were considerable they made but little impression. The neighbouring crops were attacked to a very considerable extent. The rye was nearly ripe and the oats still green, but the insects, though preferring the oats, had eaten the rye to such an extent that fully one-third of the stems bore feeding hoppers eating away the heads, very few of which had escaped injury. A particularly pernicious form of injury was the cutting through of the stem carrying the ear of grain. The corn crop was not so severely attacked. A subsequent survey showed that this particular grasshopper attack covered an area of about 25 square miles, though it was not uniformly affected throughout.

The so-called Hopper Dozer, which had been largely relied upon in the Western States for controlling grasshopper invasions, was tried with considerable success. One and a half barrels of insects being captured by one apparatus in 6 hours. Poisoning by the use of "criddle" mixture was also tried with fair success. This mixture consists of 100 lb. of fresh horse dung, 2 lb. of salt and 1 lb. of Paris green, thoroughly mixed, and enough water added to make a sloppy mass. This was broadcasted at the rate of about 400 lbs per acre. The author reports that many of the hoppers were observed to have died from bacterial or fungus disease and that fully 30 per cent. of the living insects had within their bodies one or two specimens of the so-called hairworm or cabbage snake. He recommends the use of the dozer and criddle mixture, as above described, as good practical methods of destroying grasshoppers.

Paddock (F. B.). **The Life-History and Control of the Bee-Moth or Wax-Worm; Investigations pertaining to Texas Bee-keeping.**—*Texas Agricultural Stations, Austin (Texas), Bull.* 158, June 1913, pp. 15-30, 7 pls.

This account of the life-history and control of the bee-moth (*Galleria mellonella*) forms part of a bulletin on beekeeping in general, in Texas. The author states that the damage done by the bee-moth in 1911, according to the reports of 136 beekeepers, varied from 5 to 95 per cent. The distribution, habits and life-history of the moth are fully dealt with.

Of the natural enemies of the bee-moth the most important is the honey-bee itself, and it is well known that if the colony be healthy with a vigorous queen, only small damage is done.

A small red ant (*Solenopsis* sp.) has been found to be an enemy of the pest. The author states that many cage experiments were destroyed by the ant, which ate the larvae. Among hymenopterous parasites of the bee-moth the following have been

recorded:—*Eupelmus cereanus, Bracon brevicornis* and *Apanteles lateralis*. This last parasite was discovered by Conté in France. It is known to be parasitic on larvae of other moths in England and Germany. When introduced into the hive, it attacks only the bee-moth, leaving the bee untouched. Conté introduced it artificially into hives, with good results.

Fumigation is the only means of artificially controlling the bee-moth. This may be done with sulphur or with carbon bisulphide. Dry powdered sulphur (flowers of sulphur) is burned in the air and the combs are piled up over it. It was found that larvae, subjected to the fumes of quantities of sulphur varying from $\frac{1}{4}$ to $\frac{2}{3}$ oz., for an hour, were killed. As a rule, unless the fumes are very intense, larvae which are in any way protected by webs are not killed; in any case the eggs are not destroyed. There are practical difficulties, too, in burning the sulphur, such as getting a high enough temperature to burn it efficiently, so that in practice the carbon bisulphide method is to be preferred. In using carbon bisulphide great care must be taken to keep it away from all lights as its vapour is highly explosive when mixed with air. Experiments were made with larvae, pupae and moths in different stages of development, and various quantities of carbon bisulphide were tried for varying periods of time. The results are tabulated. The quantity of carbon bisulphide used varied from $\frac{1}{6}$ to $\frac{3}{4}$ oz., and the time from 15 minutes to 24 hours. In all cases the larva, pupa or moth was killed, even when well protected. Where eggs were present, they hatched out afterwards. It is thought that with extremely large doses the eggs also would be destroyed. The moths were the most susceptible to the poison; the pupae least so. Tables are given showing the approximate amount of carbon bisulphide needed with different numbers of supers, and for fumigating the hive bodies.

Schoene (W. J.). **The Influence of Temperature and Moisture in Fumigation.**—*New York Agric. Exp. Sta., Geneva, N.Y., Tech. Bull.* no. 30, July 1913, 11 pp.

This bulletin discusses a series of fumigation tests with caterpillars of the brown-tail moth (*Euproctis chrysorrhoea*, L.) which were influenced by temperature and humidity. The fumigating material was cyanide. The experiments were carried on at different temperatures and in the presence of varying amounts of moisture. It was found that the caterpillars were more resistant to the poisonous fumes at low temperatures than at high; for example, at temperatures below 49° F., 66 per cent. of the caterpillars survived; while at temperatures above 59° F., only 25 per cent. survived. Also, it was found that fumigators under humid conditions were more destructive than those under relatively dry conditions; for example, when the difference between the wet and dry bulbs was between 10 and 17 degrees 56 per cent. of the caterpillars survived; while with a difference of only 3 to $6\frac{1}{2}$ degrees, only 3 per cent. survived. It is suggested that these differences in results and the unusual resistance of the caterpillars to fumigations are due largely to the conditions incidental to

hibernation, viz., the reduced moisture content and comparative inactivity of the insects. In hibernation the animal is in a dormant condition and the poisonous gas enters the trachae largely by diffusion, while in an active specimen the gas is drawn in by the movements of the segments. Changes in temperature probably affect the hibernating animal in several ways, but of most importance in this connection is the rate of metabolism and the resulting reflex movements. The rise of temperature increases respiration, and hence the injury is done at higher temperatures rather than at lower. As regards the action of the poison in the presence of moisture, it is suggested that when the tracheal walls are dry, the hydrocyanic gas is able to diffuse more slowly than when they are moist; it may also be due to the increased metabolism which accompanies increased moisture in the cases of a hibernating insect, though the author is inclined to attach less importance to the latter cause than to the former.

Harned (R. W.). **The Cotton-Worm Situation.** *Press Circular, Mississippi Agric. Expt. Sta., Agricultural College, Miss.*, 29th July 1913.

In answer to the inquiry as to whether the cotton worm (*Alabama argillacea*) will prove as destructive this year as in 1911 and 1912, it is stated that the prospects are that in Mississippi there will be very few worms, and that they will arrive too late to do much damage. This year very few larvae have been received from Mississippi as compared with the numbers in 1911 and 1912. Small numbers have been found in Texas, but nowhere else.

Safro (V. I.). **An Investigation of Lime-Sulphur Injury; its Causes and Prevention.**—*Oregon Agric. Coll. Exp. Station, Research Bull* no. 2, July 1913, 32 pp.

The term "lime-sulphur injury" has been understood generally to include all forms of injury to fruit or foliage, following an application of lime-sulphur, and does not imply that the injury may be due to certain chemicals contained in the spray other than the lime-sulphur itself. The first explanation that occurs to a grower who notices leaf or fruit injury immediately after an application of lime-sulphur is that the spray was "too strong." The explanation would be simple were it not for the fact that, in several instances, under similar conditions a "weaker" spray has apparently caused injury where a "stronger" spray has proved harmless. Results of this character indicate that the strength of the spray is not the primary cause of the injury. Experiments were made on the foliage of potatoes, beans, and fruit trees, and the conclusion was arrived at that the injury was due to soluble polysulphides present in the mixture, notably calcium polysulphides and, to a less extent, calcium thiosulphate. A dozen samples of lime-sulphur all having the same specific gravity may show no two samples alike in percentage of soluble sulphides, and further, a sample having a low specific gravity

may have a greater percentage of soluble sulphides than a sample having a higher specific gravity. Thus the specific gravity alone of a lime-sulphur spray does not indicate to what extent sulphides are in solution, and different experiments, using the densities of different concentrations as bases for dilution, cannot be compared accurately, so far as the spray injury is concerned. The most simple method that presents itself of avoiding lime-sulphur injury is to weaken the soluble sulphides by increased dilution. Properly prepared lime-sulphur, only boiled for an hour, is not injurious at the usual strengths. On the other hand, commercial preparations which are boiled for 4-5 hours contain a much larger proportion of the soluble sulphides, and are therefore far more injurious. Another method is to render the sulphides insoluble, which may be done by adding various substances to the spray that will break down not necessarily all the sulphides but enough to render the remainder harmless. This however impairs the insecticidal properties of the spray. To a lime-sulphur solution of 1 to 20 (at 30° B) was added copper sulphate—4 lb. to 100 gals. of the diluted spray. The resulting precipitate consisted of sulphides of copper. No injury whatever was caused by this spray. The addition of zinc sulphate instead of copper was not so satisfactory. Another form of modified lime-sulphur was made by adding commercial sulphuric acid. The proportions were not accurately measured so that the result is only indicative, but although some injury was still caused, it is thought that only the addition of more acid was necessary to complete the harmlessness of the spray. The mere fact of the sulphur being in an insoluble form is not sufficient cause for considering the fungicidal and insecticidal properties to be impaired, as the sulphur itself is an active agent. Lastly, carbon dioxide was run into a 1 to 15 dilution of lime-sulphur, until the remaining polysulphides gave the solution a clear amber colour. The amount of gas used was not measured, so that this experiment, as the previous one, was qualitative rather than quantitative. No injury whatever was caused. Cases reported as lime-sulphur injury are frequently due to other causes, often sunburn, as is indicated by the locality of the injury in relation to the sun's rays.

Oglobin (A. A.). КЪ БІОЛОГІИ БОЖЬИХЪ КОРОВОКЪ [On the biology of Coccinellids]. (From the material of the Entomological Branch of the Agricultural Experiment Station of Poltava, with a preface by the Director of the Station, N. V. Kurdjumov.)—*Revue Russe d'Entomologie, St. Petersburg*, xiii, no. 1, pp. 27–43, 21 July, 1913.

In a short preface to this article N. V. Kurdjumov points out that although the work is a result of observations conducted by the author only during the summer of 1912 the questions dealt with in it are in some respects definitely solved. The work of the author is a continuation of investigations undertaken by the Station in Poltava on the biological factors regulating the multiplication of injurious grain aphids and has been conducted under his control and with his assistance.

The author dealing with the Coccinellid fauna in the Government, states that *Coccinella septempunctata*, L., is the commonest species, *Adonia variegata*, Goeze, coming second, while *Halyzia* 14-*punctata*, L., and *Hippodamia* 13-*punctata*, L., are less frequent.

The Coccinellids winter in the imago stage, chiefly in woods, under bark or fallen leaves. They awake with the first signs of spring and the beginning of their activity practically coincides with the emergence of the stem-mother aphids from the wintering eggs, which takes place for some species as early as the second half of April. The beetles then begin to fly to the corn-fields, though a considerable proportion always remains in the woods. The eggs are deposited in clusters, usually on the underside of the leaves, and generally near the colonies of aphids, on which the larvae feed. In the second half of July the number of ladybirds reaches its maximum; and after the harvest most of them return to the woods.

Many species of ladybirds have cannibalistic habits, and various instances are cited which have been observed not only in the laboratory but also under natural conditions.

The author goes on to consider the influence of temperature on the development of the different stages of the insects, the time for which decreases with the rise of temperature and reaches its minimum in the middle of the summer. Tables are given showing the results of experiments.

The last chapter is devoted to the parasites of ladybirds. During 1911 there was found a parasite of the imago stage, *Dinocampus terminatus*, Nees, and a short report on the biology was then published. In 1912 the first cocoon of the parasite, underneath a ladybird (*C.* 7-*punctata*) eaten out by it, was found in May; in July it was found more frequently; amongst the ladybirds collected on the 4th August 6 per cent. were infected; on the 9th of that month this figure was 5 per cent. and on the 15th August 10 per cent. This parasite was found less frequently on *Adonia variegata* and only once was its cocoon found in *Halyzia* 14-*punctata*. It is calculated that the parasite has 4-5 generations during one season. In captivity the adults lived about 20 days. *Dinocampus terminatus* behaves during the oviposition much in the same way as *Meteorus*. It follows the insects obstinately, keeping its ovipositor bent underneath its thorax, so that the end of it reaches the head of the parasite. Usually the egg is deposited between the segments of the thorax, sometimes between those of the abdomen and sometimes between the wing-cases. The developmental stages are described and figured. The presence of the parasite inside *C.* 7-*punctata* cannot be discovered from its appearance. The insects act and feed like normal ones, gradually losing the power of motion before the exit of the parasites. In the case of *Adonia variegata* the presence of the parasite is visible in the last stages of its development, as the abdomen of the host becomes swollen, though without affecting its activity.

Cases of superparasitism, *i.e.*, oviposition of several eggs on the same host, were frequently noticed in the laboratory as well as on hosts brought from outside, which contained several eggs

or larvae. Inside the body of the host were found sometimes larvae as well as eggs of the parasites, from which it is concluded that the larvae do not attack the eggs. On the 10th August 3 eggs were found inside a *C. 7-punctata* containing developed embryos, 1 healthy larva in the first stage, one dead larva in the first stage and one larva in the second stage. Another case is mentioned in which there were found inside one host, which died in captivity, as many as 60 eggs in various stages of development and also young larvae in the first stage. In such cases it is assumed that the larvae in the first stage, being equipped with strong mandibles, are the most likely to survive.

The male of the *Dinocampus* is unknown, and during two years not a single male was obtained at the Station, which coincides with Ratzeburg's observations. In 1912 the females laid unfecundated eggs and these yielded only females.

In 1910 there was found for the first time another parasite of *C. 7-punctata*, viz., *Tetrastichus coccinellae*, Kurdjumov; in 1911 only one pupa of the insect was found infected by that parasite, but in 1912 it was found more frequently. This parasite always infects the larva of the host, but issues from the pupa. In ovipositing the female of the parasite gets on the back of the larva and thrusts the ovipositor into the body up to the hilt. The females remain in this position some minutes afterwards, and removing the ovipositor drink the blood from the wound. This parasite lays several eggs in the body of one larva, which always succeeds in pupating. The development of *Tetrastichus coccinellae* lasts about three weeks. The adult larva of the parasite is described. Up till now it has been found only on *C. 7-punctata*.

On two occasions a Chalcid of the sub-family PTEROMALINAE was found associated with the *Tetrastichus*.

In 1912, 10 specimens of another parasite, *Homalotylus flaminius*, Dalm., were obtained from two larvae of *C. 7-punctata*. It is assumed that this parasite can breed poly-embryonically. The larvae of the host were unable to pupate. Ladybirds were also observed to be parasitised by certain species of worms, which were found on three occasions inside the beetles.

Insect Damage to Russian Crops [ИЗВѢСТІЯ ГЛАВ. УПРАВ. З. И З.], *St. Petersburg*, no. 30, 10th Aug. 1913.

According to the Crop Reports published by the Central Board of Land Administration and Agriculture in their weekly journal up to 10th July 1913, very few injurious insects were noticed, and the damage done by them was nowhere very important. *Mayetiola* (*Cecidomyia*) *destructor*, L., appeared on wheat in many places in the Central districts, and in the Governments of Podolsk, Kiev, Taurida, Ekaterinoslav and Charkov, although no serious injury was done. The same applies also to the wheat chafer (Kyska), *Anisoplia austriaca*, Hbst., which appeared in many places on winter-sown crops, in the Governments of Orel, Voronezh, Kiev, Saratov, Penza, Little Russia and New Russia, but owing to the heavy rainfall its activity was evidently paralysed. Some serious damage was done by the larvae of

Phlyctaenodes sticticalis, L., to seeds of vetches, maize, beets, etc., in the Governments of Kursk, Kiev and Charkov, as well as in the Don Province. Peas suffered nearly everywhere from aphis, especially in the Volga Governments, Tambov and others. Sawflies were noticed in the Governments of Kiev, Bessarabia, Taurida, Vladimir, Jaroslav and Minsk, while *Thrips* sp. appeared in the Governments of Kiev, Penza and Vladimir. From some parts of New Russia came news of the appearance of locusts, which however fed mostly on grass and did not cause great damage.

As to Siberia and the provinces of Central Asia, locusts were reported from some districts of the Governments of Tobolsk, Yeniseisk and in the provinces of Akmolinsk and Semipalatinsk, where in some parts they passed from the meadows to the spring crops, mostly of wheat. Locusts were also reported from many other places, although the damage done by them was less. In the Government of Tomsk and the province of Turgai Elaterid larvae and those of *Euxoa segetum*, Schiff., were observed in some parts. *Anisoplia austriaca* played havoc with the crops, besides *Thrips* which also appeared there on wheat and winter rye. In the province of Semipalatinsk wheat was greatly damaged by *Mayetiola* (*Cecidomyia*) *destructor*, L.

In No. 39 (12th October 1913) of the same journal the following additional information is given: *Euxoa segetum* has done very considerable damage to crops in some Western Governments; in some places it was even necessary to repeat the sowings. The cold rains in August caused the insect to disappear. In the Western Governments some injury was caused by *Agrotis lineata*, L.

Uvarov (B. P.). ОТЧЕТЪ О ДѢЯТЕЛЬНОСТИ СТАВРОПОЛЬСКАГО ЭНТОМОЛОГИЧЕСКАГО БЮРО ЗА 1912 ГОДЪ [Report of the Bureau of Entomology of Stavropol for the year 1912]. *St. Petersburg*, 1913, 32 pp., 6 figs. (Published by the Central Board of Land Administration and Agriculture.)

Chief among the injurious insects of the Government are various species of locusts; the immense amount of damage done by the latter was possibly responsible for the establishment of the Entomological Bureau in 1912; a separate report on locusts and the fight against them in 1912 and during six previous years is in course of preparation.

The most wide-spread species of locust in the Government is *Stauronotus maroccanus*, *Thunb.*, the egg-masses of which have been recorded since the autumn of 1911 in 100,000 acres in one district only of the Government. Owing to the cold spring of the year under report the hatching out of the insects did not take place until the middle of May, which delay permitted the necessary precautions to be taken, and by spraying the infected area with a solution of Schweinfurt green and lime in water (at a cost of more than £5,000) the egg-masses were practically destroyed so that no damage occurred later to the crops. Next to *Stauronotus*, *Pachytylus migratorius*, L., is the most important species,

but in this year it appeared only at some places near Stavropol and was also easily destroyed. Notwithstanding the above measures, swarms of locusts invaded the Government in July, coming from the east or north. These swarms have destroyed in many parts crops of maize, millet, and grass; they have also done considerable damage to some vineyards; the insects do not devour the vine leaves but gnaw the tops of young branches, the petioles of the leaves and the grapes. Part of the invading swarms went over the Government into the provinces of Kuban and Don where they evidently oviposited; another part deposited its eggs over some 54,000 acres in the Government, chiefly in the steppes, and in cane-brakes on some of the rivers.

Anisoplia austriaca, Hbst., *Epicometis hirta*, Poda, and *Cephus pygmaeus*, L., have also done more or less serious injury to crops. *Aphis* appeared in great masses on various plants, prominent amongst them being *Toxoptera graminum*, Rond, *Sipha* sp. and *Brachycolus noxius*, Mordw., on barley; *Aphis padi*, L., *A. avenae*, F., on millet; and *A. euonymi*, F., *papaveris*, F., *rumicis*, L., on the panicles of maize. There were also recorded *Mayetiola destructor*, L., *Thrips*, larvae of Elateridae, *Lema melanopa*, L., and *Phlyctaenodes sticticalis*, L., on melons, sunflowers and some vegetables.

Linseed crops were more or less damaged by *Chloridea dipsacea*, L., which has during the last 10 years led to a considerable decrease in the cultivation of linseed, and by some Halticid beetles; sunflower crops were partly injured by *Homeosoma nebulella*, H.

Amongst orchard pests are mentioned: *Hyponomeuta malinellus*, Z., *Epicometis hirta*, Poda, *Cydia* (*Carpocapsa*) *pomonella*, L., *Aphis pomi*, de G., on apples and quinces, *Aphis grossulariae*, Kalt., on black currants, *Mytilaspis pomorum*, Bouché, on apples, *Lecanium* sp. on peaches, and *Anthonomus pomorum*, L., *Rhynchites bacchus*, L., *R. pauxillus*, Germ., *Sciaphilus squalidus*, Klug, *Apion pomonae*, F., *Eriocampa adumbrata*, Klug, *Zeuzera pyrina*, L., *Cossus cossus*, L., *Scolytus rugulosus*, Rtzb., *Cydia funebrana*, Fr., on apples and plums. The report points out that the orchards are mostly in a very neglected state and that no remedies against insect or fungus pests are generally applied, so that this branch of agriculture proves practically profitless.

The same applies in a certain degree to market-gardens which are damaged by many insects; *Gryllotalpa gryllotalpa*, L., being present in enormous numbers in some steppes, which makes the fight against them practically impossible; *Eurydema ornatum*, L., on cabbage, Halticinae, *Pieris brassicae* and *Plutella maculipennis* on cabbages, and *Aphis cucurbiti*, Buck., and *A. gossypii*, Glov., on cucumbers, are playing havoc with vegetables. The vineyards were damaged by *Ino ampelophaga*, as well as by locusts.

As to forest pests, *Melanophila decastigma*, F., and the caterpillars of *Sciapteron tabaniformis*, R., have caused serious injuries to poplar trees; the young trees were also damaged by the larvae of *Stauronotus maroccanus*, while poplars (*Populus alba*)

on the River Kuma were injured by *Monosteria unicostata*, M.R.; ash trees were very much damaged by *Hylesinus fraxini*, F., the pest appearing in such quantities that it was impossible to fight it. *Robinia pseudacacia* was damaged by *Aphis laburni*, Kalt.; *Caragana arborescens* was injured by the same insect, as well as by *Macrosiphum caraganae*, Chol.

VITKOVSKY (N.). КЪ ПОЯВЛЕНІЮ ВЪ БЕССАРАБІИ ДВУЛЕТНОЙ ЛИСТОВЕРТКИ [On the appearance in Bessarabia of *Clysia ambiguella*].—Reprint from the journal "ВѢСТНИКЪ ВИНОДѢЛІЯ" [*Messenger of Viticulture*], no. 7, 1913. *Odessa*, 1913, 3 pp.

Clysia ambiguella appears in great numbers in different parts of South Russia: Bessarabia, Crimea, Caucasus, and the Government of Astrachan. The last two rainy years were very favourable for the development of the pest, which since 1911 has appeared yearly in Bessarabia in increasing numbers, and this year it has done considerable damage, especially in the vineyards near Kishinev. The insects preferably dwell and breed on vines trained in the Moldavian fashion, *i.e.*, in thick bushes affording plenty of shade, while on plants grown "en espalier" it keeps usually to small valleys and hollows and other damp places.

The following data relating to the development of the insect are given: The moths of the first generation appear in Bessarabia in the second half of April; the life of the moths lasts about two weeks, the development of the egg about 12 days, and the life of the caterpillars about four weeks; some caterpillars found on 7th June immediately pupated when taken to the laboratory. The moths of the second generation appeared in the laboratory from 27th June onwards. In nature the pupation and the flying of the second generation take place later and is very irregular and extended. The caterpillars of the first generation pupated—in the laboratory as well as in nature—in the bunches upon which they fed, without passing outside the knot of buds bound together by their webs.

Some vine-growers have successfully undertaken the collection of the caterpillars and pupae by hand. It was too late to spray the plants with Paris green or Djipsin. Owing to the rainy weather it is expected that the second generation will prove more harmful than the first one.

KRASSILSTCHIK (T.). ВЪ ВИНОГРАДНЫХЪ САДАХЪ [(Pests) of vineyards].—*Leaflet No. 5 issued by the Entomological Station of the Government of Bessarabia, Kischinev*, 18th August 1913.

This is one of a series of leaflets periodically issued by the Bessarabia Station, containing useful information and hints for agriculturists in relation to injurious insects and fungus diseases of plants. They are issued in Russian and Moldavish.

The part pertaining to vineyards is devoted to *Clysia ambiguella*, which has appeared this year in extraordinary numbers

in some parts of the Government. Usually the caterpillars are so scarce there, that it is not easy to find them. The author describes the damage done to the blossoms by the first generation, and the injury to the grapes effected by the second. The actively injurious life of the second brood lasts only five to six weeks, after which they enter crevices of the bark of the older branches of the vines, or some other sheltered place, in which they pass the winter, having previously covered their refuges with a web and pupated.

This time is the most convenient for destroying the insects by pouring boiling water over them, by scraping them down by various mechanical appliances, or by cutting away parts of the branches and burning them. As to remedies against the first generation of caterpillars while they are attacking the blossoms of the vine, the spraying of various arsenical substances is not considered to have proved successful, and it is recommended to apply the method of hand-collection and destruction. There are no means known by which to fight the second generation of caterpillars while they are actually devouring the grapes, and it is recommended to catch the moths in the evenings by fixing poles in the vineyards with cans containing fermenting liquids (beer residues, sugar water with yeast, etc.) and lanterns suspended above them.

As to orchards, the leaflet contains general suggestions for remedies against *Cydia* (*Carpocapsa*) *pomonella*, such as bait-belts, etc.

Soprotzko (A.). ЧТО ТАКОЕ ОЗИМЫЙ ЧЕРВЬ И КАКЪ СЪ НИМЪ БОРОТЬСЯ [*Euxoa segetum*, Schiff., and how to fight it].—*Published by the Entomological Station of the Zemstvo of the Government of Tula, Moscow*, 1913, 11 pp., 2 figs., 1 pl.

This is a popular description of *E. segetum*, its life-history, diseases, parasites, and methods of fighting it, issued at a nominal price ($1\frac{1}{4}d.$) to secure general distribution.

Euxoa segetum is declared to have destroyed in 1909 about 270,000 acres of crops in the Government of Tula; and equal damage has been done by it in some neighbouring Governments.

Amongst the natural enemies of the pest are mentioned: flacherie, a disease caused by the fungus *Tarichium megaspermum*, Chor., and insect parasites, notably Tachinid flies. Figures are given of *Ophion luteus*, F., and of *Gonia capitata*, de G. Attention is also drawn to birds (rooks and starlings) which destroy the caterpillars, and it is stated that in localities frequented by rooks damage is never very great.

The remedies recommended are: (1) to keep the fallow land clear of mud, by early ploughing (not later than May), etc., or the sowing of vetches, with oats or with mixed grasses, after the removal of which the stubble must be at once re-ploughed; (2) in case the above remedies cannot be applied it is suggested to use at about 2 weeks before the sowing, baits of potatoes or weeds, on one portion of the land, keeping the remaining portion clear;

(3) when the caterpillars have appeared the attacked portions of the field must be divided from the rest by a trench with vertical sides, 7″ deep; (4) to put troughs containing molasses and water round the fields as soon as the moths appear (about the end of May); the cost of this method for 270 acres of fallow land is calculated to be about 16*s*.

By applying the last method in 1910 on one estate about 30,000 moths were destroyed.

Vassiliev (Prof. E. M.). ОБЪ ОДНОЙ МѢРѢ БОРЬБЫ СЪ МОРКОВНОЙ МУХОЙ [On a method of fighting *Psila rosae*, Fabr.].—Reprinted from the journal "САДОВОДЪ И ОГОРОДНИКЪ" [*The Horticulturist and Market Gardener*], *Kiev*, 1913, 6 pp.

This is a leaflet giving in a popular form some information on the life-habits of this insect and on one remedy against it. In Russia the "carrot fly" is found in the neighbourhood of St. Petersburg and Moscow, and in the Government of Mohilev and Poland. The author found it also in one district of the Government of Kiev, and apparently it occurs also in the Governments of Volhynia and Podolia. The insect flies twice a year, in April and May, and again through July and early August. The eggs are laid on the beds of carrots, from which the larvae get into the roots of these plants. The author noticed only straight worm-holes, not sinuous ones, as usually reported, and parallel to the length of the roots. The larvae leave the roots throughout June to pupate. The flies issue at the beginning of July or in August, and late in August the larvae appear again. Although it is usually understood that the insects winter in the pupal stage, the author found in the cellar of his house on the 1st January 1913 in roots of stored carrots some larvae of *P. rosae*. He suggests as a remedy catching the flies in May and in June in molasses, dissolved in water, to which ordinary beer yeast is added. Vessels with this liquid ought to be put on the beds and in the cellars, where the newly emerged flies are to be found. The roots damaged by the insects should be put into boiling water, to kill the larvae, after which they may serve as food for cattle. In this way the number of the insects of the second generation will be decreased. To destroy the pupae in the earth of the beds, the latter must be dug over in autumn.

Jemmett (C. W.). **Notes on the chief Insects affecting Forest Trees in Great Britain.**—*S.E. Agric. Coll., Wye, Kent*, N.D. (1913), 44 pp.

The author gives the following as the most important insects injurious to forest trees in the United Kingdom:—

Lepidoptera: Goat Moth (*Cossus cossus*), Winter Moth (*Cheimatobia brumata*), Mottled Umber Moth (*Hybernia defoliaria*), Brown-tail Moth (*Euproctis chrysorrhoea*), Black Arches (*Lymantria monacha*), Green Oak Tortrix (*Tortrix viridana*), Larch Coleophora (*Coleophora laricella*).

Coleoptera: Common Cockchafer (*Melolontha vulgaris*), Pine Weevils (*Hylobius abietis* and *Pissodes notatus*), Pine Beetle (*Hylurgus piniperda*), Spruce Bark Beetle (*Tomicus typographus*), Ash Bark Beetle (*Hylesinus fraxini*), Elm Bark Beetle (*Scolytus destructor*).

Hymenoptera: Steel Blue Wood Wasp (*Sirex juvencus*), Giant Wood Wasp (*Sirex gigas*), Pine Sawflies (*Lophyrus pini* and *Lophyrus rufus*), Large Larch Sawfly (*Nematus erichsoni*), Douglas Fir Seed Fly (*Megastigmus spermatrophus*).

Hemiptera: Spruce and Larch Aphis (*Chermes abietis laricis*), *Chermes piciae*, *Cnaphalodes strobilobius*, *Pineus strobi* (*Chermes corticalis*), *Pineus pini*, Willow Scale Insect (*Chionaspis salicis*), Felted Beech Coccus (*Cryptococcus fagi*).

The paper concludes with a list of preventive measures against insect attacks:—

(1) Preserve, where sporting considerations permit, such enemies of injurious insects as bats, moles, hedgehogs, weasels, stoats and most song-birds (especially the cuckoo, which is the only bird to devour hairy caterpillars); the erection of nesting boxes for starlings, titmice, etc., is helpful in this direction; (2) carefully consider the soil, situation and climate before deciding the species of tree to grow; (3) form mixed plantations in preference to pure, as there are more insectivorous birds in mixed than in pure woods, and the danger from gales, snow, fire and fungoid disease is less; (4) examine the woods carefully and frequently, so as to anticipate the death of a tree, and have it removed before it is actually in a fit state to be appropriated by the insects; (5) carefully thin out at once all sickly stems; (6) bark all conifer logs left lying in the woods after April, and burn the bark; (7) grub up the stumps of conifers, where possible, before re-planting; (8) where felling in winter is practised, ring and leave standing a few stems here and there as decoys in order to attract bark beetles; fell and bark these, and burn the bark in order to prevent the ova and larvae developing into mature insects and multiplying; (9) remove as soon as possible all thinnings and falls of timber, and clear away all the branches and brushwood; (10) make good as soon as possible any damage occasioned by wind, snow or fire in the wood; (11) timber which is designed for estate work and is carried to the sawmill should be peeled or cut up, and in the latter case the slabs should be burned or peeled; (12) cut the trees as close to the ground as possible; (13) burn all bark where peeling is done.

Jack (R. W.). **Termites or "White Ants."**—*The Dept. of Agriculture, Bull. no.* 139, *Salisbury, Rhodesia*, Feb. 1913, pp. 1-16.

The injuries due to termites are divided under three heads:—(1) Injury to dead wood; (2) injury to living trees; and (3) injury to stacked and standing crops.

As preventative dressings against injury to dead wood, only those containing soluble arsenic have been found to be any good. Coal tar on account of its feeble power of penetrating the wood

is not alone a safe preventative. The arsenical preparations which have been successfully used are the following (taken from the Transvaal Agricultural Journals for Oct. 1907, April 1909, and Oct. 1909):—(1) Arsenite of soda, 10 per cent. solution—*i.e.*, 1 lb. to each gallon of water; (2) Atlas preservative, full strength; (3) Atlas preservative, 10 per cent. solution; (4) Demuth's dip, 10 per cent. solution; (5) Cooper's dip, 1 pint to 9 gals. water; (6) Alderson's cattle dip, 4 lb. to 8 gals. water. The wood was soaked for 24 hours, or soaked for 24 hours and boiled. Tests were also made with the Atlas preservative by giving the wood one or two coats with a brush. Wood so treated resisted termite attacks for 3 years. The following preparations failed to make the wood resistant for 3 years:—Street's white ant cure, coal tar (one coat), Stockholm tar, creosote, solignum, asphenite, crude carbolic acid, Jeyes' fluid, carbolineum, various tobacco extracts, various paints, oils, soaps, etc. Copper sulphate in saturated solution protected wood for three years, but weaker solutions failed. Methods involving the use of the brush have advantages over methods involving dipping the whole piece of timber into a receptacle containing the fluid. Ends of timber that are to be inserted in the ground can be soaked in a barrel and then given a coating of coal tar—the coal tar prevents water reaching and dissolving out the poison. Arsenite of soda is the cheapest of the above-mentioned remedies. It is important to coat all possible inlets for the termites into the wood, such for example as mortices or other joints cut in the wood after it has been dipped or painted, and any holes left by removal of nails, etc. As a result of experiments to see whether one wood was more resistant than another to termite attacks, it was found that only two were untouched at the end of three years, *viz.*, leadwood (*Combretum porphyrolepis*) and black ironwood (*Olea laurifolia*). Vaalbosch (*Brachylaena discolor*) was untouched for two years, but was attacked during the third year. In Southern Rhodesia the wood of the Mopani tree (*Copaifera mopani*) is found to resist termite attack for years; it is suitable for fencing or straining posts, but it is not a timber that can be cut and squared.

Remedies against termites which have already made some inroad into timber consist in locating the nest, and destroying it by means of the machine known as the Universal Ant Destroyer. This machine generates a poisonous gas which penetrates into all the ramifications of the nest and kills the ants. As a further preventative, all brick buildings on land where termites occur should have a "zinc ant course," *i.e.*, strips of zinc laid on the first course of bricks over the whole foundations and projecting at least one inch on each side of the wall; this effectually prevents the termites from ascending the wall.

Remedies against termites attacking living trees are not many, and all are expensive to use as they require frequent renewal. The following remedies are given:—Copper sulphate, 1 lb. in 50 gals. water; weak solutions of Jeyes' fluid or carbolic acid; tobacco water, tar water, soap solution, etc. Tobacco dust round the trees is a temporary expedient. These preparations are not recommended to the commercial planter, but are useful in cases

where there are only a few trees to protect. Experiments were made in connection with certain species of termites which have the habit of ring-barking fruit trees just above the ground, and as a result it was found that a band of coal tar, 8 ins. above the ground was satisfactory. As in the case of timber infested by termites, the Universal Ant Destroyer is the best weapon against attacks upon trees, this being better than poisoning by carbon bisulphide. Poisoned bait is another remedy: the formula usually adopted is that used against cutworms:—1 lb. of an arsenical compound, 8 lb. of treacle or black sugar, and 10 gals. of water. Arsenite of soda is the cheapest arsenical compound, but as this is soluble in water, it must not be used near the fruit trees. In view, however, of the extraordinary fecundity of the queen, poisoning the workers, even the majority of them would not by any means destroy the pest, and in any case, it is not to be supposed that the majority of the workers will fall a prey to the poison. Putting the poison actually into the nest would have better results. The trees most susceptible to attack are plum, apple, apricot, and fig, and citrus trees in Southern Rhodesia. Peach trees, if healthy, are stated to be safe in Natal, but, according to the author, a tree in Salisbury was attacked.

As regards injury to standing crops, this is due to "harvesting" or "marching" termites [*Hodotermes*], which differ from other termites in having functional eyes and in carrying out their work in the open. These can also be killed by the Ant Machine, while they are working, by inserting the funnel of the machine into the hole into which they are carrying the forage. At other times the passages are closed and impervious to fumes. A layer of wood ash, several inches deep on the ground to be used for the stack has had good results, according to a Rhodesian farmer, in keeping the ants away from the stack. The layer was formed by burning the wood on the spot.

Blais (M.). **Insectes Nuisibles. Influence des conditions météorologiques sur la multiplication de quelques insectes.** [Harmful Insects. The influence of meteorological conditions on the multiplication of certain insects.]—*Jardinage, Versailles*, iii, no. 17, April 1913, p. 430.

A short article upon the way in which climatic conditions, temperature, moisture, etc., affect the propagation of insects. For example, the cold summer of 1911 proved fatal to the vine pest, *Clysia ambiguella*, and its second generation passed almost unnoticed. In the case of the cabbage moth, the absence of heat during the summer prevented the escape of the moth from the chrysalis, and the usual large numbers of moths were not seen. Owing to the rains of the autumn in 1910 the valleys were flooded, and the larvae of *Cheimatobia brumata* were suffocated, and only very few moths emerged in November and December. Observations were also made upon *Hyponomeuta*. These moths emerge in July, August, and September, but the low temperature which prevailed during these months was unfavourable to fertilisation and very few eggs were laid.

Cox (H. R.). **Oriental Pears and their Hybrids.**—*Cornell Univ. Agric. Exp. Stn., Ithaca, N.Y., Bull.* no. 332, May 1913, pp. 438-488, 17 figs., 1 pl.

This bulletin, which gives the results of experiments made at Ithaca upon the Oriental pear (*Pyrus sinensis*), its cultivated varieties, and the hybrids between it and the common pear (*P. communis*), contains a short account of the insect pests of these trees, of which the following are the more important: those injurious to the trunk are the pear tree borer, scurfy black louse, and the San José scale; those injurious to leaves are the pear tree slug, blister mite, and pear tree psylla, those injurious to the fruit are the pear tree midge, codling moth, and plum curculio. The last two are the worst pests. Other insects of less importance are the round-headed and flat-headed apple-tree borers, oyster-shell scale, pear lecanium, and pear blight beetle. Except in the case of San José scale, there is not sufficient evidence to show whether any of the above-mentioned insects are more or less injurious to Oriental pears than to common pears. Oriental pears, however, have been found free from scale, while common pears standing near them have been destroyed. Professor J. B. Smith of New Jersey reports that "Kieffers" alone are absolutely exempt and, closely following, the "Le Conte," which is rarely infested in the nursery and never in his experience, in the orchard. One tree grafted with Lawson and Kieffer had the Lawson branch and fruit covered with scales, while the Kieffer was entirely free. The Oriental pear is native to the countries where this insect has existed for centuries, and it is reasonable to expect its hybrid descendants to resist the pest better than can other species never before exposed to its attacks. Observers have reported that the scale has failed to establish itself on certain hybrid trees that have been repeatedly infested artificially. But although it would seem that certain hybrid trees are immune, this cannot be maintained for the whole race. While the Oriental hybrids, as a race, are not immune to the scale, certain trees seem to resist it very effectively. This points to a line of possible usefulness in breeding hybrid trees that are practically scale-free, by selecting buds and grafts from resistant trees.

Patch (Edith M.). **Aphid Pests of Maine: Willow Family.**—*Maine Agric. Exp. Stn., Orono, Bull.* no. 213, June 1913, pp. 73-100, 25 figs., 4 pl.

This bulletin contains a descriptive list of Aphid pests on trees of the willow family in Maine, together with collection data of pests on corresponding trees in other parts of the world. The following pests are described:—*Pemphigus populimonilis*, Riley; *P. populiconduplifolius*, Cowen; *P. populicaulis*, Fitch; *P. bursarius*, L.(?); *P. gravicornis*, sp.n., *Chaitophorus populicola*, Thomas; *C. viminalis*, Monell; *C. delicatus*, sp.n., *Aphis salicicola*, Thomas; *A. populifoliae*, Davis; *Macrosiphum laevigatae*, Essig; *Melanoxantherium bicolor*, Oestlund; *M. salicti*, Harris; *M. sinithiae*, Monell; *M. salicis*, L.; and *M. antennatum*, sp.n.

The life-history of certain gall-forming species of the poplar is not known, but the fact that *Pemphigus betae* is known to winter on the cottonwood, suggests that other pests on the willows and poplars may change their host periodically, and plants of economic importance may serve as the alternate host. The paper is accompanied by a food-plant catalogue of the APHIDAE of the world, and is illustrated by 4 plates and diagrams.

FULMEK (L.). **Zur Arsenfrage in Pflanzenschutzdienst, besonders betreffend das Bleiarseniat.** [Arsenical Insecticides with special reference to Lead Arsenate.] — *Sonderabdruck aus Archiv für Chemie and Mikroskopie*, 1913, Heft 6. *Mitteilung der k. k. Pflanzenschutz Station in Wien*, 62 pp.

Dr. Fulmek in this paper deals largely with the chemistry of the various arsenic preparations used for destroying plant pests, and has classified the literature on the subject under different headings, corresponding with the different compounds of arsenic which may be used. The article does not deal with specific remedies for particular pests, but with the chemical nature of remedies, in virtue of which they are useful, or dangerous. The author describes shortly the methods used in different parts of the world in dealing with arsenic compounds, and the conditions for their use laid down by the law in these countries.

The bibliography occupies no less than 38 pages—more than half the entire paper—and under each entry the composition of the preparation most recommended is given.

FULMEK (L.). **Die Kräuselkrankheit (Akarinose) des Weinstockes.** [Mite Disease of the Vine.]—N.d., 32 pp., 4 pls., 12 figs.

The disease of vines which has been called "Akarinosis" is the cause of very considerable loss. It has a very wide distribution, including France (where it is known as court-noué) Switzerland, the Rhine, Portugal, Sicily, &c. The symptom which is most characteristic, is the stunted growth due to a shortening of the internodes; and it has been shown to be caused by the presence of a mite. The mites are quite invisible to the naked eye, and can only be seen and identified in special preparations under high powers of the microscope. The leaf stalk is, in such a preparation, removed from the leaf: the leaf is pressed between two glass slides and its underside is examined. Numerous, whitish, worm-like little animals are seen in the angles of the principal veins. They are at first sight hardly distinguishable from the common vine-leaf pest, *Eriophyes vitis*, Nal. They are shown however to belong to a different species. On account of the difficulty of identification, the k. k. Pflanzenschutzstation, Vienna, undertakes the examination of material free of charge.

Regarding the particular species of mite, there has been a certain amount of controversy. Faes and Müller said it was

identical with *Eriophyes vitis*. In 1905 Chodat described it as a new species, and called it *Phytoptus bullulans*. Nalepa about the same time described it as *Phyllocoptes vitis*, Nal., and in 1909 Burnat and Jaccard discriminated two forms, *Epitrimerus vitis*, Nal., and *Phyllocoptes vitis*, Nal. The author found *Epitrimerus* in all material collected in the summer, and is convinced that the disease, in summer at least, is due entirely to *Epitrimerus* and not to *Phyllocoptes*.

As regards the spread of the disease, very little is known for certain. The mites are observed to migrate from one plant to another, and often appear in a vineyard for the first time attacking solitary plants here and there. On account of the great damage caused by the pest, it is earnestly asked that all facts relating to symptoms shall be watched for, and that, in the view of the extreme ease with which it spreads, every precaution to combat it shall be taken.

In 1912 experiments were carried on under the Vienna Pflanzenschutzstation, with the object of testing the value of different remedies. These experiments were made at Herzogenburg, Eggenburg and Kottingbrunn. The remedies used were as follows:—Polysulphides of alkalis or liver of sulphur in 3 per cent. aqueous solution; lime-sulphur mixture diluted with 2, 3 or 5 parts of water; Dendrin in 4 and 5 per cent. aqueous emulsion; Demilysol in 4 per cent. and 5 per cent. aqueous emulsion.

The vineyard experimented with in Herzogenburg had 9,000 plants (Neuburger-Riparia), planted in 1908. The disease attacked the vine in 1911, and in the autumn the plants were treated. Shortly, the results were as follows:—Demilysol proved useless: Dendrin was rather better; the lime-sulphur mixture acted very well, and best of all the liver of sulphur. In Kottingbrunn 49,800 plants were dealt with, including several different varieties: in this case the lime-sulphur treatment gave the best results, one in three of the plants escaping the disease altogether. In Eggenburg 7,659 plants were treated. It was found that spraying the underside of the leaves with the lime-sulphur mixture gave very good results, infected leaves and shoots becoming again quite normal, and growing as if never infected.

The author summarises his results as follows:—(1) lime-sulphur mixture is the best remedy. On account, however, of the ease with which the use of liver of sulphur can be controlled, the plants clearly showing whether it has been properly distributed or not, this has great advantages as a remedy. After having been painted with the solution of liver of sulphur a greyish stain is left on the leaf. (2) If diseased plants appear in the summer, it is essential to deal with the whole plot early in the following spring, as it is then that the means of spreading the disease are most potent. (3) If the disease is only observed for the first time when the vines are in bud, the stem, shoots and all the old wood must without delay be thoroughly sprayed with lime-sulphur mixture (1 pint of the mixture to 5 gallons of water) and it must be continued until the old wood is soaked with the liquid.

The paper contains photographs of the vine showing various stages of the disease, and photo-micrographs of the mite on the leaf.

Fulmek (L.). **Die Schwefelkalkbrühe.** [Lime-Sulphur Mixture.] —*Mitt. der k. k. Pflanzenschutzstation Wien*, n.d. (1913), 9 pp.

This memoir deals with the preparation and use of lime-sulphur mixture, and its effect on pests. The author says that the following may be taken as an average of the proportions of the materials used in its preparation, based on various well-known formulae:—Quick lime 1, sulphur 2-2¼, water 9-11; all parts by weight. The three following formulae are in general use:—(1) American formula—Water 100, sulphur 19·175, quick lime 8·628-9·587; (2) formula used in Hamburg commercial preparations—Water 15, sulphur 2·2, quick-lime 1·3; and (3) Italian formula (Savastano)—Water 100, sulphur 20, quick-lime 10; all parts by weight.

Lime-sulphur mixture is relatively very cheap, more so than the lime-copper mixture. The materials for 1 hectrolitre (19 gals.) of concentrated liquid costs 5*s.* to 10*s.*; 1 hectolitre diluted for winter use costs about 1*s.* 8*d.* to 2*s.* 6*d.*, and diluted for summer use, costs about 4*d.* to 6*d.* Savastano reckoned that according to his formula 1 hectolitre (19 gals.) of an 8 per cent. solution, for winter use, costs about 6*d.*, of a 4 per cent. solution, for summer use, about 2½*d.*-3*d.* The author summarises the use of the lime-sulphur mixture as follows:—It can only be used against a few specified pests such as scale-insects, gall-mites and fungus diseases. It can be used instead of the lime-copper mixture, and is to be preferred on the grounds of its cheapness and its harmful effect on the green parts of the plant. As it is not, however, a universal remedy lime-copper mixture and other recognised remedies should not be put aside.

Miestinger (K.). **Der Apfelwickler** (*Cydia (Carpocapsa) pomonella*, L.).—*Sonderabdruck aus "Der Obstzückter,"* no. 2, 1913, 5 pp., 3 figs.

A description of *Cydia pomonella*, with a brief account of its life-history and of the usual methods of control, viz., the destruction of the maggot in the fallen fruit, keeping the stored fruit in closed rooms to avoid the moth, and methods of spraying.

Jones (C. R.) & Mackie (D. B.). **The Locust Pest.**—*The Philippine Agric. Rev., Bureau of Agriculture Circular No.* 23, *Manila*, 31st July 1913, pp. 417-424, 2 pls.

This article is practically a reprint of a paper by the same authors published in Vol. vi., no. 1, January 1913, of the same journal, of which an abstract appeared in Series "A"; p. 65 of this Review.

WAHL (B.). **Die Bekämpfung der Blattläuse (Aphidae).** [Remedies against Aphids.] — *Sonderabdruck aus Monatshefte für Landwirtschaft*, 1913, *Mitt. der k. k. Pflanzenschutzstation, Wien*, 4 pp.

This is a short paper dealing with the common green fly (*Aphis*) and the methods useful in combating it, which the author divides into summer and winter remedies.

Summer Remedies.—

1. Tobacco extract and soft soap solution: a good solution is made up of 3 lb. tobacco extract and 3 lb. soft soap, to 20 gals. water. The soft soap is dissolved in a quart of hot water, and the rest of the water with the extract added.

2. Tobacco extract and lysol mixture: 2-3 lb. tobacco extract and ¼-½ pint lysol or demilysol in 20 gals. water. Mix the water with the extract and add the lysol.

3. Petroleum and soft soap emulsion: 3 lb. soft soap is dissolved in 5 or 6 pints of hot water, and mixed and shaken with ¾ pint of petroleum. This is put into a vessel into which a funnel is fitted, so that the mixture can be well shaken and water added at intervals; 7-8 quarts of water are added and the mixture shaken until a milky emulsion is formed (the petroleum should no longer form an oily layer on the surface).

4. Quassia and soft soap mixture: 3 lb. quassia chips is boiled in 2 gals. of water and left standing for 24 hours; the liquid is then poured off; this is mixed with an equal volume of neutral soap solution, made by dissolving 5 lb. of soap in 2 gals. of water. This remedy is useful when the others mentioned are unsuitable on account of their smell.

The addition of soap and lysol or demilysol in these remedies counteracts any harm which the spraying liquid might do, and they increase the power of the liquid to kill the pest. Plants which are grown for seed or fruit and must be pollinated should not be sprayed during their flowering period.

Methods involving fuming may be used in closed rooms. For fumigation in hot houses, etc., tobacco powder is mixed with wood-charcoal in a vessel and allowed to burn for 12 hours; or tobacco extract is steamed on hot iron plates, it being first of all diluted with twice its volume of water. Certain delicate plants are not able to withstand the tobacco fumes.

Winter remedies.—As the plants are not growing, much stronger remedies may be used in winter than in summer.

1. Schilling's petroleum-soft soap mixture: 15 dkg. of soap are dissolved in 1 litre hot water, and 180 dkg. petroleum added (but *not* over the fire!). The emulsion is shaken and diluted with 4-5 times its volume of water.

2. Soluble fruit tree carbolineum (obstbaumkarbolineum): the commercial preparation is diluted with 5-20 times its volume of water and is applied early in spring.

3. Lime-sulphur mixture. This is recommended in America, but was used in the Pflanzenschutzstation without results.

Vayssière (P.). **Le Pou de San José**—*Aspidiotus perniciosus*, **Comst.** [The San José Scale.]—*La Revue de Phytopathologie Appliquée, Paris*, i, nos. 6 and 7, 20th Aug. and 5th Sept. 1913, pp. 81-85, 3 figs.

All fruit trees are attacked by this pest, except the chestnut, fig, cherry and vine. The most susceptible to attack are the pear, peach, plum and apple. On the peach the older parts are attacked before the young shoots; an infested tree can be killed in 2-3 years. On the apple and the pear, the small terminal shoots are the most infested, as also is the mature fruit. Some varieties exhibit a certain degree of immunity to the parasite, such as, according to Marlatt, American pears of the varieties "Leconte" and "Kieffer." Forest or ornamental trees most liable to attack by the San José scale are those belonging to the following genera:—*Acacia, Cotoneaster, Crataegus, Fagus, Populus, Ribes, Rosa, Salix, Tilia, Ulmus*, etc. The following are not attacked:—*Ailanthus, Cedrus, Corylus, Gingko, Hedera, Ilex, Magnolia, Platanus, Quercus*, etc., also the conifers, except *Picea alba* and *Thuya*, which are occasionally attacked. Herbaceous plants are apparently immune; the strawberry, however, and the species *Digitaria sanguinalis* and *Asclepias cornuti* are attacked. Nursery plants, when invaded, seldom reach maturity and may remain merely vegetative for several years.

Die Bekämpfung des Heu -und Sauerwurms mit Conchycid (Conchylin). [Combating the Vine Moth with Conchycid.]—*Bericht über den 27ten deutschen Weinbaukongress in Mainz, vom* 6-11 *Sept.* 1913. *Luxemburger Weinzeitung, Grevenmacher*, i, no. 28, 15th Oct. 1913, pp. 486-488.

Experimenters have treated different vine-stocks at different times with Conchycid (formerly known as Conchylin), as a remedy against the second generation of *Clysia ambiguella*. The stocks were dealt with at the end of July and beginning of August. The quantity of liquid used varied from 8-15 gallons for 1,000 stocks. The time taken in applying the liquid occupied from 5-24 hours. In one case, 1,000 stocks treated with 15 gallons of liquid during 24 hours resulted in 35-40 per cent. of worms being killed. This was the result of a single treatment. Upon a second spraying, remarkable results were obtained. While a neighbouring vineyard hardly bore any grapes, the treated plots bore the full quantity, which were green and healthy. Vines treated with Conchycid were healthier than those sprayed with nicotin. As yet there is no sign of any damage done by the Conchycid itself. It is said that it gives the juice a peculiar flavour, but even if this be true, it disappears entirely during fermentation. The price of Conchycid is about 3 marks (3*s.*) for 100 litres (22½ gals.). A 1½ per cent. nicotin mixture costs at least 3·45 marks (3*s.* 5½*d.*) for 100 litres. Conchycid can be added to Bordeaux mixture, just as nicotin may, but its action as a simple solution in water is equally effective. Sugar and casein can be added, if necessary. Soap is best left out of the mixture. Conchycid is not poisonous. Any spraying apparatus can be used and the metal is not attacked.

NOTICES.

The Review of Applied Entomology is intended to contain, month by month, abstracts of the latest information published concerning insects injurious to man or animals, as the carriers of disease; and to forests, fruit trees, crops or stored merchandise.

The Editor will be glad to receive prompt information of the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion, the adoption of which would increase the usefulness of the Review.

Authors are especially requested to send to the Editor, as early as possible, copies of their papers for notice in the Review and for preservation in the Library of the Bureau, as it is hoped to form a complete collection of the literature of the subject.

Writers are also earnestly requested to send old reprints, as these are often very difficult to obtain.

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